



## **Rapid Ecological Assessment for the Central Sand Plains Ecological Landscape**

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### **An Inventory and Analysis of Rare Plants and Animals and High-quality Natural Communities in Support of a Master Plan**

Wisconsin's Natural Heritage Inventory Program  
 Bureau of Natural Heritage Conservation  
 Department of Natural Resources  
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**Primary Authors:** Ryan O'Connor, Rich Staffen, Amy Staffen, and Kevin Doyle

**Contributors:**

- Andrew Badje – herptile and bumblebee surveys
- Julie Bleser – data management
- Kevin Doyle – rare plant surveys, data processing, report writing assistance and review
- Terrell Hyde – data processing
- Heather Kaarakka – small mammal surveys
- Ryan O'Connor – inventory coordination, rare plant and natural community surveys, report writing and coordination
- Rori Paloski – herptile surveys
- Amy Staffen – rare plant and natural community surveys, data processing, report review
- Richard Staffen – inventory coordination, bird surveys, herptile surveys, small mammal surveys, data processing, report writing assistance and review
- Paul White – small mammal surveys

**WDNR Reviewers:** Amy Staffen, Rich Staffen, Kevin Doyle, Becky Roth, Jon Robaidek, Armund Bartz, Craig Anderson

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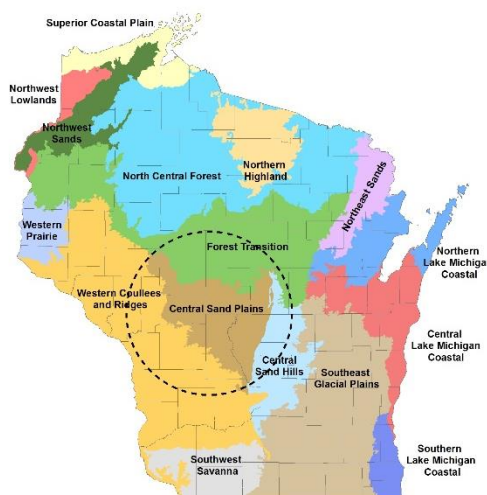
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# Introduction

## Purpose and Objectives

This report is intended to be used as a source of information for developing the master plan for the Central Sand Plains Ecological Landscape (CSP EL).

The primary objectives of this project were to collect biological inventory information relevant to the master plan for properties in the CSP EL and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of habitat for rare species and identifying natural community management opportunities.



**Map A.** Ecological Landscapes of Wisconsin.

Surveys for the CSP EL were conducted in 2017 and 2019 and focused on 1) identifying and evaluating ecologically important areas, 2) documenting or updating rare species occurrences, and 3) documenting or updating occurrences of high-quality natural communities. This report serves as the “Biotic Inventory” used for master planning. There will undoubtedly be gaps in our knowledge of the biota of these properties, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work. Inventory data collected through this effort is a starting point for adaptive management of properties in the CSP EL and should be revisited periodically and updated when new information becomes available.

This inventory was limited to properties being actively planned that had not previously been inventoried by the Wisconsin DNR’s Bureau of Natural Heritage Conservation (NHC) (Table 1). Previous inventories also relevant to the CSP EL should be consulted as necessary for a more complete assessment of the conservation opportunities for properties in the Central Sand Plains EL (Table 2).

**Table 1. Properties included in the Central Sand Plains Ecological Landscape rapid ecological assessment.**

Augusta Wildlife Area
Bauer-Brockway Barrens State Natural Area
Black River State Forest (select barrens sites only)
Brooks Bluff State Natural Area
Cranberry Creek Mounds Group State Natural Area
Dell Creek Wildlife Area
Dells of the Wisconsin State Natural Area
Jay Creek Pine Forest State Natural Area
Lemonweir Bottomland Hardwood Forest State Natural Area
Little Plover River Fishery Area
Mill Bluff State Park
Quincy Bluff and Wetlands State Natural Area
Roche-a-Cri State Park, including Roche-a-Cri Mound SNA and Roche-a-Cri Woods SNA
Rocky Arbor State Park
Sohlberg Silver Lake State Natural Area

**Table 2. Properties in the Central Sand Plains Ecological Landscape inventoried through previous NHI rapid ecological assessments.**

Property	Inventory Report/Rapid Ecological Assessment	Year Surveyed
Big Roche-a-Cri Fishery Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Black River State Forest	<a href="#">Black River State Forest and Meadow Valley Landscape</a> (WDNR 2005)	1997-99
Buena Vista Wildlife Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Central Wisconsin Grassland Conservation Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Colburn Wildlife Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Dewey Marsh Wildlife Area	<a href="#">Central Wisconsin Wildlife Areas Property Group</a> (WDNR 2012a)	2011
Hulburt Creek Fishery Area, including Hulburt Creek Woods SNA	<a href="#">Driftless Area Streams</a> (WDNR 2012b)	2010
Leola Marsh Wildlife Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Meadow Valley Wildlife Area	<a href="#">Black River State Forest and Meadow Valley Landscape</a> (WDNR 2005)	1997-99
Mill Creek Fishery Area	<a href="#">Driftless Area Streams</a> (WDNR 2012b)	2011
Paul Olson Wildlife Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015
Sandhill Wildlife Area	<a href="#">Black River State Forest and Meadow Valley Landscape</a> (WDNR 2005)	1997-99
Ten Mile Creek Streambank Protection Area	<a href="#">Central Sand Plains Planning Group</a> (WDNR 2016)	2015

## Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR's Bureau of Natural Heritage Conservation (NHC) and is a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization coordinates the network (see [www.NatureServe.org](http://www.NatureServe.org) for more information).

Natural heritage programs track certain elements of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The NHI Working List (WDNR 2018) contains the elements tracked in Wisconsin. They include endangered, threatened, and special concern plants and animals, as well as the natural community types recognized by NHI. The NHI Working List is periodically updated to reflect new information about the rarity and distribution of the state's plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR website (*Wisconsin Natural Heritage Working List*).

The Wisconsin NHI uses standard methods for biotic inventory to support master planning. Our general approach involves collecting relevant background information, planning and conducting surveys,

compiling and analyzing data, mapping rare species and high-quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. NHC's biotic inventory projects typically start with a coarse-filter assessment, followed by targeted surveys for priority taxa, then data processing, analysis and report writing. Survey scope and intensity corresponds to the study area size and ecological complexity, as well as resource availability.

Taxa-specific field surveys for the CSP EL were focused on documenting high quality natural communities, rare plants, breeding birds, small mammals, herptiles, and terrestrial invertebrates (Table 3). The collective results from these surveys were used, along with other information, to identify, evaluate, and update ecologically important areas (Primary Sites) of the CSP EL.

**Table 3. Survey Targets and Methods for Biotic Inventory on the Central Sand Plains EL in 2017 and 2019.**

Survey Target	Surveyors	Methods
Animals		
Breeding Birds	NHC Staff	Surveys followed Wisconsin Breeding Bird Atlas II protocols. Emphasis placed on areas not covered by Atlas blocks.
Herps	NHC Staff	Visual encounter searches for frogs, salamanders, snakes, lizards and turtles.
Small Mammals	NHC Staff	Transects utilizing Sherman live traps
Terrestrial inverts	NHC Staff	Visual encounter surveys for lepidopterans, bees, and tiger beetles
Rare plants	NHC Staff	Meander surveys targeting barrens, wetlands, forests and cliffs.
Natural Communities	NHC Staff	Meander surveys focused on characteristic species, community boundaries, threats and management issues.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the CSP EL, key inventory considerations included the identification of open wetlands, barrens, cliff communities, upland and lowland forests, and the location of habitats that had the potential to support rare species. Private lands, including easements, were not surveyed.

Plant nomenclature follows the Wisconsin State Herbarium (WIS). Vertebrate animals follow standard common names.

For a description of the geology, historical vegetation, and current vegetation of the Central Sand Plains EL, please see Chapter 10 of the [Ecological Landscapes of Wisconsin](https://dnr.wi.gov/publications/2014a) (dnr.wi.gov, keyword Ecological Landscapes) (WDNR 2014a).

# Management Considerations and Opportunities for Biodiversity Conservation

The Ecological Landscapes of Wisconsin highlights six major conservation and management opportunities for the Central Sand Plains Ecological Landscape (WDNR 2014a). These are summarized below, and a list of Primary Sites are presented under each item as examples. This list of sites is not meant to be exhaustive. Property planners and managers may identify important resources outside of primary sites by consulting the NHI Portal, NHI Biotic Inventory survey data or contractor reports, NHC District Ecologists, and other resources noted in the subsections below.

## Extensive Pine, Oak, and Mixed Forests

Western parts of the CSP EL contain extensive areas of relatively contiguous upland forest. These forests tend to be dry, are composed mostly of pines and oaks, and may occur in homogeneous even-aged stands or in various mixtures of species, sizes, and age classes. On glacial lakebed and outwash landforms, the terrain is nearly level and the water table is often high. Areas of dry forest are interspersed in complex patterns with peatlands, including some that are very large. In areas underlain by ridges of sandstone bedrock, the terrain can be rugged and steeply rolling. Site conditions on such terrain vary from dry to dry-mesic, and there may be considerable variation in forest composition and structure. The extensive forests afford protection to streams and wetlands at the local site and watershed levels.

In part because they are extensive, the forests of the CSP EL can accommodate the vast majority of forest inhabitants native to this region, including wide-ranging and area-sensitive species and many habitat specialists. At larger scales, management opportunities are best for species adapted to drier forests dominated by either oaks or pines. But there are also good opportunities to manage for forests and wildlife associated with wet conditions. The larger blocks of relatively unbroken forest in the western part of the ecological landscape occur on the Black River State Forest and the Clark and Jackson County Forests. Sites in Adams, Juneau, and Wood counties offer opportunities to manage upland forests at more moderate scales. Managing for oak beyond commercial rotation ages is highly desirable to retain key forest structural elements and accommodate habitat needs of certain species (e.g., red-shouldered hawk, cerulean warbler). Dry-mesic sites capable of supporting large northern red and white oaks are best suited to this, but some stands of black oak might also be considered. In addition to live trees, other important structural elements include large standing snags and large coarse woody debris. However, an overabundance of dead wood from oak wilt can create a management impediment. Key forest management challenges overall include avoidance of fragmentation, isolation, and simplification. Currently there is an under-representation of large patch sizes (for both younger and older forest), intact older forest, and certain cover types (e.g., jack pine, natural red pine). The needs of habitat specialists and connections with other landscape features such as floodplains and conifer swamps should be considered and addressed by planners and managers early in the planning process for their respective jurisdictions.

The largest opportunity for conservation is described in the report for the [Black River State Forest and Meadow Valley Landscape](#) (WDNR 2005). Properties inventoried in 2017 that have conservation opportunities for extensive pine, oak, and mixed forests include:

- Quincy Bluffs and Wetlands SNA (see primary site description below)

## Oak and Pine Barrens

Oak and pine barrens communities are globally rare, geographically limited in distribution, and support many rare and declining plants and animals. In Wisconsin, barrens vegetation is restricted almost entirely

to four ecological landscapes, including the CSP EL. Finley (1976), in his interpretation of the federal General Land Office public land survey notes of the mid-19th century, mapped extensive areas of barrens in what are now the counties of Adams, Eau Claire, Jackson, Juneau, Portage, and Wood. The acreage of oak and pine barrens declined precipitously because of conversion to agricultural uses following Euro-American settlement and through successional processes that followed the implementation of widespread fire suppression policies in the 1920s and 1930s and ultimately resulted in dense forests of pine or oak. Many remnant oak and pine barrens now occur along roadsides and within other rights-of-way and on some sites with coarse-textured soils of low nutrient status that are relatively unfavorable for the growth of trees. In recent years, wildfires have occurred in several areas overgrown with woody vegetation that historically supported barrens. Conservation and restoration opportunities are concentrated in those parts of the state that have drought-prone sandy soils of low nutrient status, level or gently rolling topography and that were historically subject to frequent wildfires.

Properties inventoried in 2017 and 2019 with good-quality oak and pine barrens include:

- Bauer-Brockway Barrens SNA (see primary site description below)
- Black River State Forest (see primary site descriptions for four barrens sites below)
- Quincy Bluffs and Wetlands SNA (see primary site description below)
- Roche-a-Cri Mound and Woods SNAs (see primary site description below)

## **Rivers and Streams, Floodplains, and Riparian Corridors**

The largest rivers flowing through the CSP EL are the Wisconsin and Black. Both are classified as warmwater rivers, as are the other large streams here such as the Yellow, Lemonweir, Plover, East Fork of the Black, and the North Fork and South Fork of the Chippewa River. The East Fork of the Black River is a warmwater stream noted for its good water quality, intact aquatic and adjoining wetland habitats, and diverse assemblages of fish and invertebrates. The lower Lemonweir River supports a population of a globally rare mussel. Notable coldwater streams include the Little Lemonweir River (Monroe and Juneau counties); White, Big Roche a Cri, Fordham, and Fairbanks creeks (Adams County), and the lower reach of Tenmile Creek (Wood County). Numerous other streams are classified as Exceptional Resource Waterways with good water quality and healthy assemblages of aquatic life.

Several rivers passing through and draining this ecological landscape have developed extensive and complex floodplains. The most abundant natural community associated with floodplains of the large rivers here is floodplain forest, dominated by deciduous trees adapted to periodic inundation. Slight changes in elevation within the floodplain create a diversity of soil textures, soil nutrients, and soil moisture conditions, and these partially account for the complex vegetation mosaic present in floodplain systems.

The large floodplains of the Central Sand Plains Ecological Landscape support extensive forests of high value to specialized plants and animals, and these forests could also serve as connecting corridors with landscapes to the north, south, and west. Floodplain planners and managers need to consider the entire gradient of natural communities and aquatic features from the main channel across the floodplain to the adjoining uplands as well as the connectivity a forested floodplain can provide both within and across ecological landscapes. Avoid activities (e.g., constructing a road at the wetland-upland interface) that fragment, isolate, or simplify floodplain systems and their associated natural communities and those that impair site hydrology.

Properties inventoried in 2017 with good-quality rivers, streams, floodplains, and riparian corridors include:

- Dells of the Wisconsin SNA (see primary site description below)
- Jay Creek Pine Forest SNA (see primary site description below)
- Lemonweir Bottomland Hardwood Forest SNA (see primary site description below)
- Roche-a-Cri Mound and Woods SNAs (see primary site description below)

## Forested and Non-forested Peatlands

Wetlands occupying poorly drained areas of sandy glacial lakebed or outwash sands are abundant in the CSP EL. The combination of subdued topographic relief, coarse textured soils, and a high water table creates stark and sharply marked contrasts between the xeric uplands and adjoining wetlands, resulting in a complex vegetation mosaic based on slight elevational differences and past disturbance events. Most of these wetlands can be grouped as “acid peatland” communities: open bogs, central poor fens, muskegs, and conifer swamps, all of them characterized by a more or less continuous carpet of sphagnum mosses upon which a limited but specialized group of sedges, ericaceous shrubs, insectivorous plants, and coniferous trees grow. These resemble the boggy wetlands of northern Wisconsin, but include species that are not found or are very scarce in more northern regions.

A unique forested wetland occurring primarily in the CSP EL is white pine-red maple swamp, a community that occurs on mucks and shallow peats over partially saturated sand. A high water table favors the growth of an understory composed mostly of wetland species. This is a structurally complex forest community that supports a distinctive assemblage of plants and animals, including some that are rare. Groundwater seepage is a characteristic and important attribute of this forest type, and spring runs or headwaters streams originate from some stands. Though not classified as a peatland community, this type often adjoins peatlands, may support a ground cover of sphagnum mosses, and should be managed with contextual considerations, hydrological sensitivity, associated rare species, and scale in mind.

Properties inventoried in 2017 with good examples of forested and non-forested peatlands include:

- Augusta Wildlife Area (though portions have been hydrologically altered by dikes, ditches, and constructed duck ponds)
- Jay Creek Pine Forest SNA (see primary site description below)
- Quincy Bluffs and Wetlands SNA (see primary site description below)

## Surrogate Grasslands

Large areas of “surrogate” grasslands on the level terrain east of the Wisconsin River and southwest of the city of Stevens Point have been managed for decades by the Wisconsin DNR to provide breeding habitat for a population of the greater prairie chicken. Historically, this area was vegetated with a mosaic of large peatlands, barrens, and xeric forests, but following settlement by Euro-Americans, the wetlands were drained and the forests cleared for agricultural purposes. While this area now supports relatively little native vegetation, the extensive grasslands here constitute one of Wisconsin’s most important management opportunities for grassland birds, including many species that are experiencing local, regional or range-wide declines. Current land cover includes blocks of permanent grass, composed mostly of non-native “cool season” species such as Kentucky and Canada bluegrass, smooth brome, orchard grass, timothy, and quack grass, intermixed with areas of pasture and cropland. A few sites support a limited complement of native prairie plants, but these areas are minor in extent.

In recent decades, the implementation of more intensive agricultural practices has diminished the amount of suitable habitat available for many native grassland species of conservation concern. Additional

management considerations include a dropping water table, atmospheric nitrogen deposition which fuels the growth of shrubs and weedy species, habitat fragmentation, and the difficulty of large-scale management (e.g., prescribed burning, grazing, or mowing) to maintain areas in an open condition.

While no properties inventoried in 2017 contained surrogate grassland of high conservation importance, other previously surveyed properties provide significant conservation opportunities, particularly Buena Vista, Leola Marsh Wildlife Areas and other properties in the [Central Sand Plains Planning Group](#) (WDNR 2016).

## Geologic Features

Cambrian sandstones are the dominant bedrock types in the Central Sand Plains, though the distribution of exposures of these sandstones is localized. The most dramatic and distinctive settings in which rock is exposed in this ecological landscape are on and around the nearly level plain formerly occupied by Glacial Lake Wisconsin. Here, there are buttes, mesas, pinnacles, and chimneys, which may rise several hundred feet above the surrounding flatlands. These unique landforms are the eroded remnants of the mostly horizontally oriented sedimentary strata that formerly covered much of central Wisconsin. Most of these are dry, but at a few locations, the heavily shaded rock surface is moist to the touch and supports plants that require a more or less permanently moist substrate and protection from desiccation. Due to their aesthetic qualities and unique attributes (no other Wisconsin landscape has a collection of geological features resembling these), several sites showcasing the colorful, sculpted sandstone bedrock have been acquired by public agencies and are now protected.

The other unusual setting in which bedrock exposures occur in the Central Sand Plains are in the narrow sandstone gorges carved by small high gradient tributaries of the Black and Wisconsin rivers. The gorges (canyons, gulches, and glens, in local parlance) contain stretches of moist cliffs because the porous sandstones are able to receive and transmit water from higher elevations. The narrow ravines are heavily shaded and perpetually humid and may experience cold air drainage as a daily phenomenon. Eastern hemlock, disjunct from its usual more northerly range, is a locally dominant tree at several sites here, accentuating the already unusual environmental conditions. The bedrock features also support many rare plants and several rare animals. Most of these rare species are bedrock specialists, and some of them are associated with no other habitat. Rocky bluffs with a sparse covering of trees may support understory plants adapted to our now greatly diminished prairie or savanna communities.

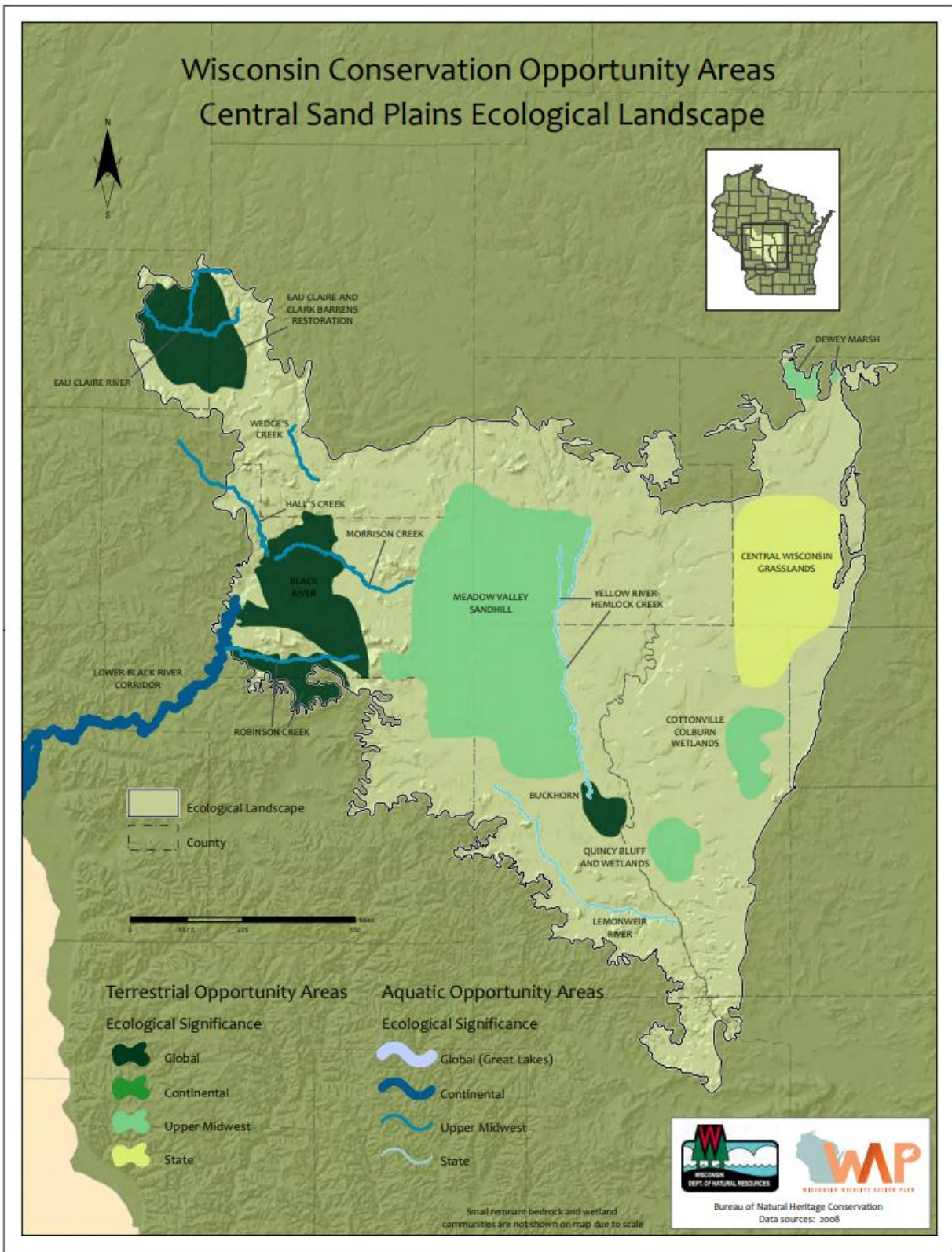
Properties inventoried in 2017 with good examples of sandstone cliffs, buttes, mesas, and gorges include:

- Dells of the Wisconsin River SNA (see primary site description below)
- Mill Bluff SNA (see primary site description below)
- Quincy Bluffs and Wetlands SNA (see primary site description below)
- Roche-a-Cri Mound and Woods SNAs (see primary site description below)

## Wildlife Action Plan Implementation and the Central Sand Plains Ecological Landscape

### Conservation Opportunity Areas

Conservation Opportunity Areas (COAs) are places in Wisconsin that contain ecological features, natural communities, or SGCN habitat that present the greatest likelihood of successfully implementing conservation actions when viewed from the global, continental, upper Midwest, or state perspective (WDNR 2008). Several COAs occur in the CSP EL.



Map B. Conservation Opportunity Areas of the Central Sand Plains EL (WDNR 2008).

## Opportunities for Natural Community Conservation

Opportunities for sustaining natural communities in Ecological Landscapes were developed by the Ecosystem Management Planning Team (EMPT 2007) and focused on wildlife Species of Greatest Conservation Need and their habitat in the Wisconsin Wildlife Action Plan (WDNR 2015). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the Ecological Landscape while maintaining important components of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within each Ecological Landscape.

The Wisconsin Wildlife Action Plan (WDNR 2015) identifies 43 natural communities for which there are "High" or "Moderate" opportunities for protection, restoration, or management on the Central Sand Plains Ecological Landscape (Table 4). For information on conservation actions that are beneficial for these communities, please refer to the Wisconsin DNR website, keyword "Wildlife Action Plan".

**Table 4.** Natural Communities with High or Moderate Opportunities for Protection, Restoration or Management in the Central Sand Plains EL (WDNR 2014a).

Community Type	
<a href="#">Alder Thicket</a>	<a href="#">Northern Sedge Meadow</a>
<a href="#">Aspen-Birch</a>	<a href="#">Northern Tamarack Swamp</a>
<a href="#">Black Spruce Swamp</a>	<a href="#">Northern Wet Forest</a>
<a href="#">Cave</a>	<a href="#">Oak Barrens</a>
<a href="#">Central Poor Fen</a>	<a href="#">Open Bog</a>
<a href="#">Central Sands Pine-Oak Forest</a>	<a href="#">Pine Barrens</a>
<a href="#">Coastal Plain Marsh</a>	<a href="#">Poor Fen</a>
<a href="#">Coldwater Streams</a>	<a href="#">Riverine Impoundment</a>
<a href="#">Coolwater Streams</a>	<a href="#">Riverine Lake-Pond</a>
<a href="#">Conifer Plantation</a>	<a href="#">Sand Barrens</a>
<a href="#">Dry Cliff</a>	<a href="#">Sand Prairie</a>
<a href="#">Dry Prairie</a>	<a href="#">Shrub-carr</a>
<a href="#">Dry-mesic Prairie</a>	<a href="#">Southern Dry Forest</a>
<a href="#">Emergent Marsh</a>	<a href="#">Southern Dry-mesic Forest</a>
<a href="#">Floating-leaved Marsh</a>	<a href="#">Southern Mesic Forest</a>
<a href="#">Floodplain Forest</a>	<a href="#">Southern Sedge Meadow</a>
<a href="#">Moist Cliff</a>	<a href="#">Submergent Marsh</a>
<a href="#">Moist Sandy Meadow</a>	<a href="#">Surrogate Grasslands</a>
<a href="#">Northern Dry Forest</a>	<a href="#">Warmwater Rivers</a>
<a href="#">Northern Dry-mesic Forest</a>	<a href="#">Warmwater Streams</a>
<a href="#">Northern Hardwood Swamp</a>	<a href="#">White Pine-Red Maple Swamp</a>
<a href="#">Northern Mesic Forest</a>	

## Opportunities to Conserve Species of Greatest Conservation Need (SGCN) and Rare Plants

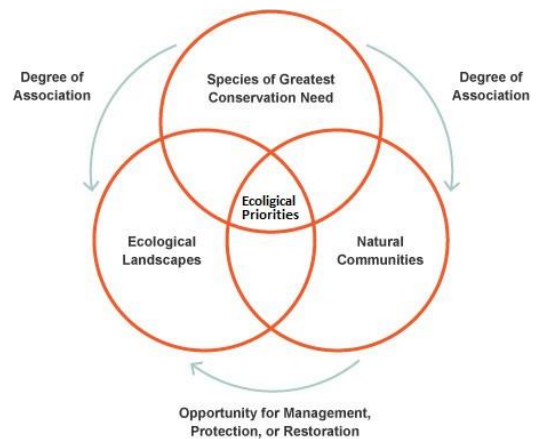
The Wisconsin Wildlife Action Plan also notes Species of Greatest Conservation Need (WDNR 2015) associated with each Ecological Landscape. Species of Greatest Conservation Need (SGCN) are animals that have low and/or declining populations that need conservation action. They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g., dragonflies, butterflies, and freshwater mussels) that:

- Are already listed as threatened or endangered;
- Have few, low, or declining populations, and/or threats their populations or habitats;

- Are stable in number in Wisconsin, but declining in adjacent states or nationally;
- Have biological, genetic or ecological characteristics that place them at risk or make them vulnerable to decline.

There are 108 SGCN and 50 rare plants highly or moderately associated with the Central Sand Plains Ecological Landscape. This means that these species are significantly associated with the EL, and that restoration of natural communities with which these species are associated would significantly improve their conditions.

The Wisconsin Wildlife Action Plan also identifies ecological priorities for conservation by highlighting the natural communities in each Ecological Landscape that are most important to the SGCN (Figure 1). While many communities that occur on the CSP EL have major or important conservation opportunities, some of these communities support more SGCN and rare plant species than others (Figure 2). For example, oak and pine barrens support a significant number of rare species in the CSP EL. Although all of these rare species do not necessarily occur on DNR properties, natural communities with higher species counts provide a disproportionate benefit to a greater number of SGCN and rare plants across the CSP EL and may warrant special consideration in the master planning process. This intersection of SGCN and rare plants with priority natural communities represents the best opportunities for management on the CSP EL from an ecological and biodiversity perspective. For a complete list of which SGCN are associated with the CSP EL, please see the Wisconsin Wildlife Action Plan website (<https://dnr.wi.gov/>, keyword "Wildlife Action Plan"), or for species associated with specific natural communities, see the natural community pages (<https://dnr.wi.gov/>, keyword "Natural Communities").



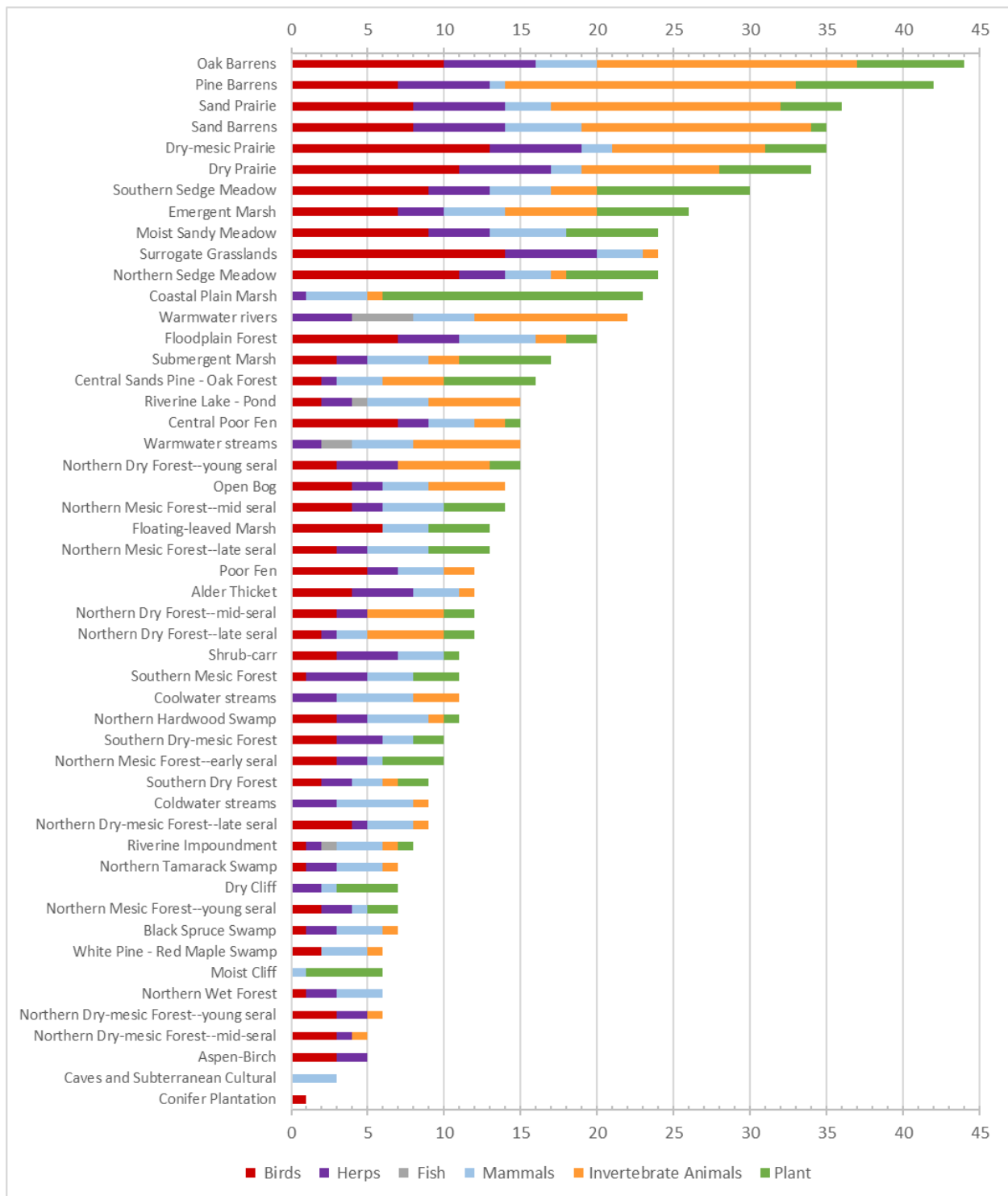
**Figure 1.** Diagram of ecological priorities based on the Wildlife Action Plan.

Taxa and species-specific conservation opportunities in the CSP EL include:

- Rare animals, especially invertebrates, associated with **sand/pine/oak barrens and sand prairies** (e.g., Karner blue butterfly, phlox moth, regal fritillary, frosted elfin, Persius duskywing, and gorgone checker spot). Other rare animals associated with these habitats includes sharp-tailed grouse, vesper sparrow, gophersnake, and slender glass lizard.
- Rare animals associated with **wetland complexes**, including eastern massasauga, whooping crane, American bittern, Le Conte's sparrow, Blanding's turtle, and dragonflies such as the incurvate emerald and ringed boghaunter.
- Rare animals associated with **large open grasslands** (including surrogate grasslands), such as greater prairie chicken, Henslow's sparrow, upland sandpiper, and short-eared owl.
- Rare animals associated with **open oak and pine forests**, such as red-headed woodpecker, eastern whip-poor-will, and eastern pipistrelle and other bats.
- Kirtland's warbler, found in **dense, young jack pine** and occasionally red pine stands with a diverse ground layer.
- Rare plants associated with **sand/pine/oak barrens**, including woolly milkweed (*Asclepias lanuginosa*), dwarf milkweed (*A. ovalifolia*), sand violet (*Viola sagittata* var. *ovata*), clustered sedge (*Carex cumulata*), straw sedge (*Carex straminea*), and prairie fame-flower (*Phemeranthus rugospermus*).

- Rare plants associated with **wetlands**, including twining screwstem (*Bartonia paniculata*), grassleaf rush (*Juncus marginatus*), Virginia meadow-beauty (*Rhexia virginica*) and reticulated nutrush (*Scleria reticularis*).
- Rare plants of **sandstone cliffs**, including:
  - Cliff cudweed (*Pseudognaphalium saxicola*), one of only two plants endemic to Wisconsin
  - Lapland azalea (*Rhododendron lapponicus*), birds-eye primrose (*Primula mistassinica*), maidenhair spleenwort (*Asplenium trichomanes*), Sullivant's cool-wort (*Sullivantia sullivantii*), rock clubmoss (*Huperzia porophila*), associated with moist cliffs. Many of these species reach their highest abundance in the state on properties in the CSP EL.
- Rare aquatic species of **rivers and streams**, such as salamander mussel, western sand darter, river redhorse, and Sioux (sand) snaketail dragonfly, endemic to Wisconsin.

The CSP EL also plays a significant role in the conservation of the federally endangered Karner blue butterfly, found in pine and oak barrens and associated habitat as described above. Wisconsin's Karner Blue Butterfly Habitat Conservation Plan (WDNR 2010b) is the document that accompanies the federal incidental take permit (ITP) from the U.S. Fish and Wildlife Service to the DNR. The permit and the plan are designed to protect and conserve the butterfly while allowing activities to occur that could impact them or their habitat. The DNR is to follow protocols (conservation measures) per the ITP while conducting work in the Karner high potential range to minimize impacts to the butterfly. More information can be found at [dnr.wi.gov](http://dnr.wi.gov), keyword "Karner blue".



**Figure 2.** Number of SGCN and Rare Plants Highly or Moderately Associated with Natural Communities that have High or Moderate Opportunities for Protection, Restoration or Management in the Central Sand Plains EL.<sup>1</sup>

<sup>1</sup> Figure represents the SGCN and rare plants that are moderately or highly associated with the respective natural communities. Species and natural communities represented are limited to those that are moderately to highly associated with the Central Sand Plains EL.

# Primary Sites: Site-specific Opportunities for Biodiversity Conservation

Thirteen ecologically important sites were identified on the Central Sand Plains Ecological Landscape during surveys in 2017 and 2019 (Map C). These “Primary Sites” were delineated because they generally encompass the best examples of:

- 1) Rare and representative natural communities,
- 2) Documented occurrences of rare species populations, and/or
- 3) Opportunities for ecological restoration or connections.

**Table 5.** Central Sand Plains EL Rapid Ecological Assessment Primary Sites based on 2017 and 2019 surveys.

Code	Primary Site Name
CSPEL01	Bauer-Brockway Barrens SNA
CSPEL02	Jay Creek Pine Forest SNA
CSPEL03	Mill Bluff SNA
CSPEL04	Cranberry Creek Mound Group SNA
CSPEL05	Roche-a-Cri Mound and Woods SNAs
CSPEL06	Quincy Bluffs and Wetlands and Sohlberg Silver Lake SNAs
CSPEL07	Brooks Bluff SNA
CSPEL08	Lemonweir Bottomland Hardwood Forest SNA
CSPEL09	Dells of the Wisconsin River SNA
CSPEL10	Black River State Forest Palm Road Barrens
CSPEL11	Black River State Forest Cemetery Road and Staffon Road Barrens Complex
CSPEL12	Black River State Forest Sandpillow Barrens
SCPEL13	Black River State Forest Millston Ridge Barrens

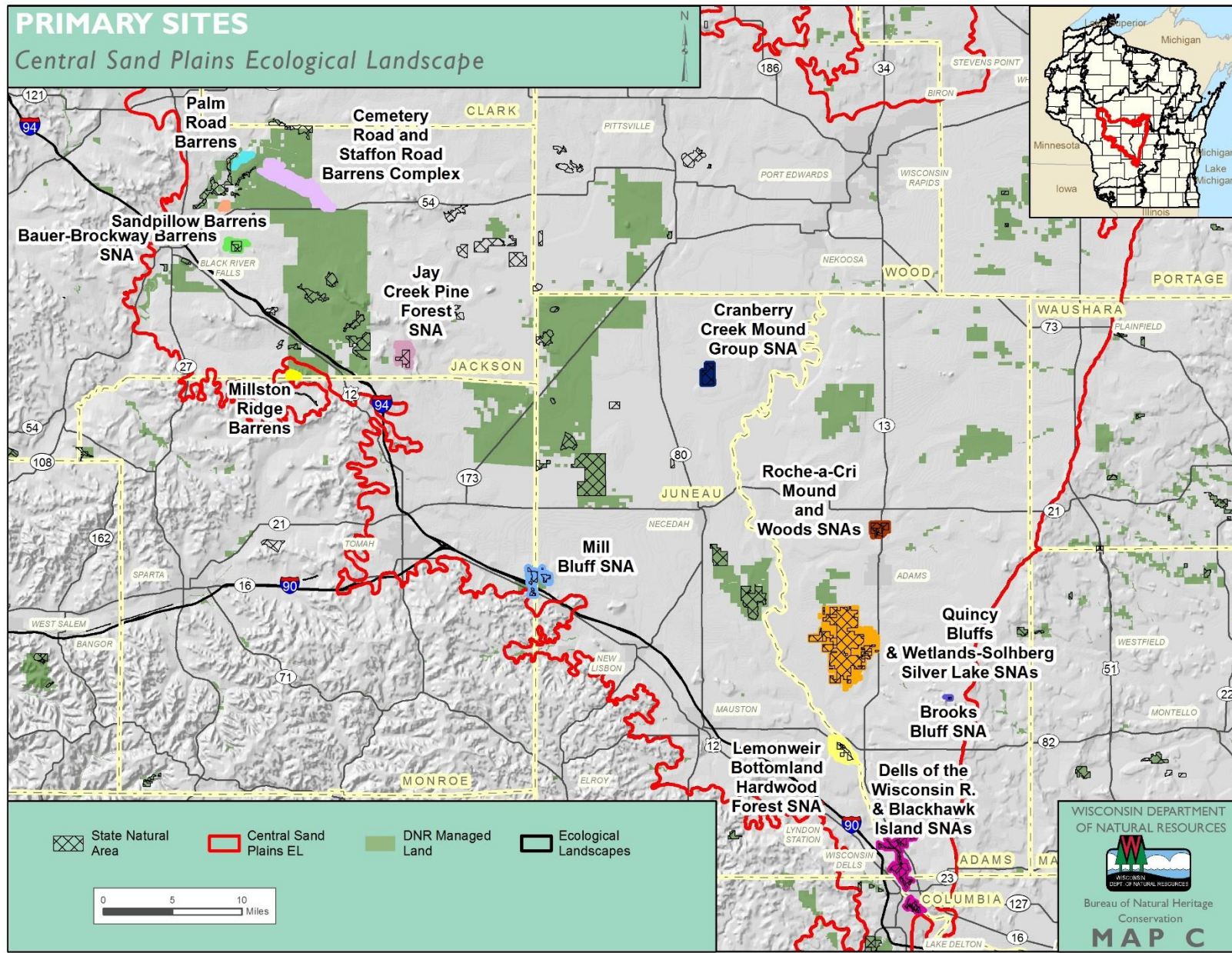
These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

Primary Sites are also considered High Conservation Value Forests (HCVFs) for the purposes of Forest Certification, which requires the identification and periodic monitoring of HCVFs. All DNR-managed lands, including state forests, parks, wildlife and fishery areas, and natural areas are certified. Certified forests are recognized by the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI) as being responsibly managed (Forest Stewardship Council 2009).

Information provided in the summary paragraphs below includes location information, a site map, summary of the natural features present, important plant and animal species, the site’s ecological significance, and management considerations.

The Primary Sites described below are in addition to the sites identified during other Rapid Ecological Assessments and Biotic Inventory Reports that occur within or partially within the CSP EL, including:

- [Black River State Forest and Meadow Valley Landscape](#) (WDNR 2005)
- [Central Sand Plains Planning Group](#) (WDNR 2016)
- [Central Wisconsin Wildlife Areas Property Group](#) (WDNR 2012a)
- [Driftless Area Streams](#) (WDNR 2012b)



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## CSPeL01. BAUER BROCKWAY BARRENS SNA

### **Location**

Property:	Bauer Brockway Barrens SNA
Landtype Association:	Jackson Siliceous Sand Plain (222Ra19)
Approximate Size:	513 acres (320 within current SNA boundary)

### **Description of Site**

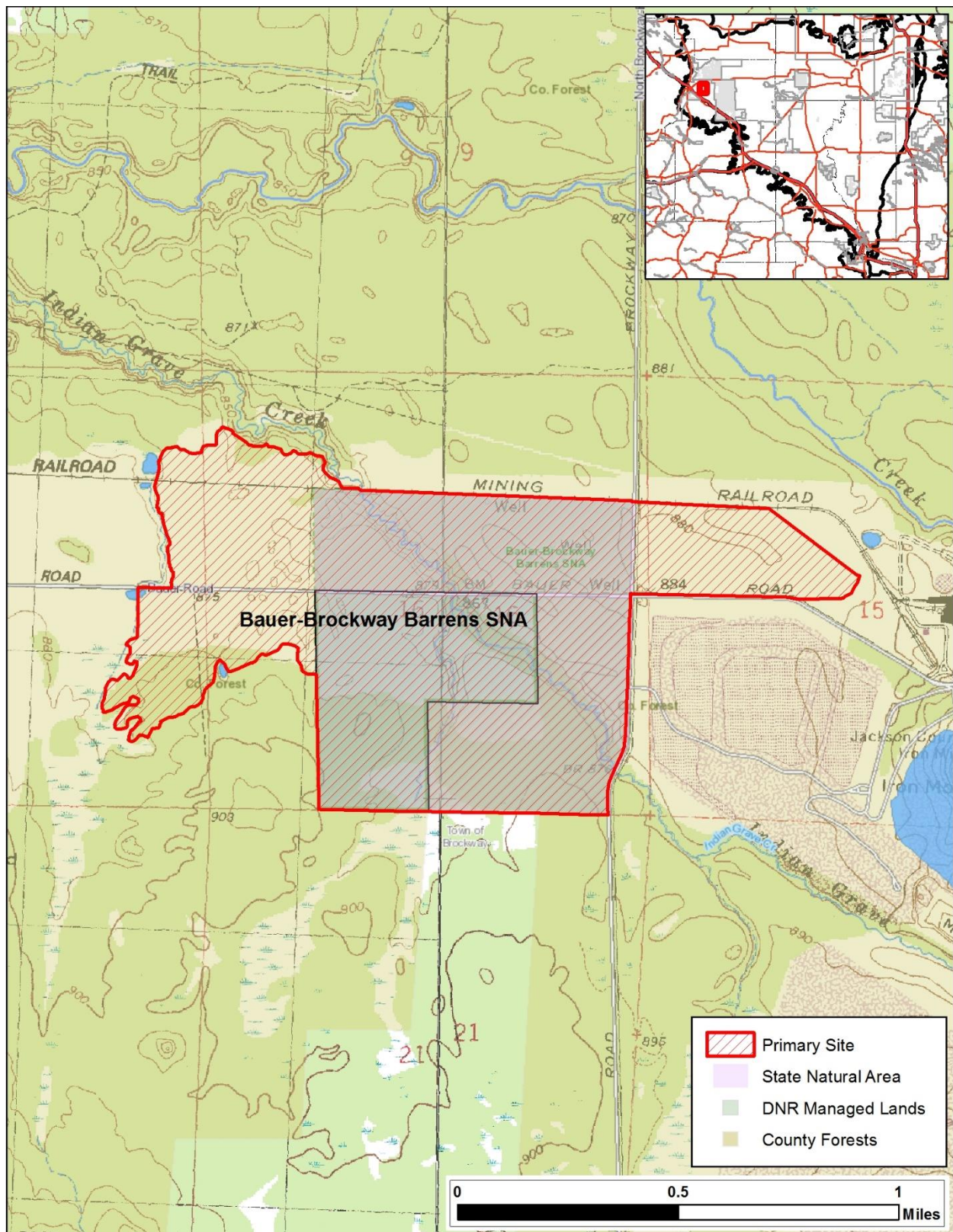
[Bauer Brockway Barrens SNA](#) features pine barrens with scattered jack pine and Hill's oak amidst prairie grasses, forbs, and shrubs located on the level sandy soils characteristic of the extinct Glacial Lake Wisconsin. American hazelnut and New Jersey tea dominate the shrub layer while barrens species dominate the understory with little blue-stem, June grass, western sunflower, bastard-toadflax, cream wild indigo, flowering spurge, yellow flax, pale-spike lobelia, sand primrose, and bird's-foot violet. Composites are especially diverse with five asters, four species of goldenrod, and three species of blazing-star. Pocket gopher mounds dot the more open areas of the site, creating small zones of mineral soil important for germination of some plant species. Indian Grave Creek runs northwest to southeast through the barrens adding to the overall site diversity.

### **Significance of Site**

The site has a diverse butterfly component including several rare species. It also features one of the most diverse moth fauna of any barrens in the state. A state-threatened plant is also known from the site. The site is located within the Black River Conservation Opportunity Area, a COA of global significance for its barrens and wetlands. Bauer Brockway Barrens is owned by the DNR and Jackson County. The central 320 acres of the site was designated a State Natural Area in 1997.

### **Management Considerations**

Barrens require a partially open canopy, and portions of the site has been managed with both timber harvests and occasional prescribed fire. Incorporating refugia into prescribed burns is crucial due to the large number of potentially fire-sensitive lepidopteran species. Currently, some portions of the barrens are more closed-canopied due to fire suppression, lack of timber harvest, or other management targeted at opening the canopy. Forest stands in the site originated following the 1977 Brockway Fire that burned 17,590 acres. Areas along Indian Grave Creek are heavily infested with glossy buckthorn (*Frangula alnus*), which is spreading into the uplands. Buckthorn control was initiated in 2014 and continued strategic control is crucial to the long-term integrity of the site. Other invasives are present as well, including small colonies of crown vetch and bird's-foot trefoil, which appear to have been intentionally planted along the roadside. Although slightly more than half of site is already designated as a State Natural Area, the entire primary site has characteristics of an ecological reference area and the SNA boundary could be expanded. While the current SNA and core of the best barrens occur on DNR property, the primary site extends onto Jackson County forest land, highlighting the opportunity for partnership to expand barrens habitat. The opportunity for cross-agency management on state and county lands is significant, in that several thousand acres of barrens and working forest could be managed as a landscape-scale habitat mosaic, and could include this property plus Black River Forest to the north and east and adjacent county forest land (WDNR 2005).



**CSPEL01. Bauer Brockway Barrens SNA Primary Site**

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## CSPEL02. JAY CREEK PINE FOREST SNA

### **Location**

Property: Jay Creek Pine Forest SNA  
Landtype Association: Jackson-Juneau Sandstone Knolls and Terraces (222Ra16)  
Approximate Size: 967 acres (442 within current SNA boundary)

### **Description of Site**

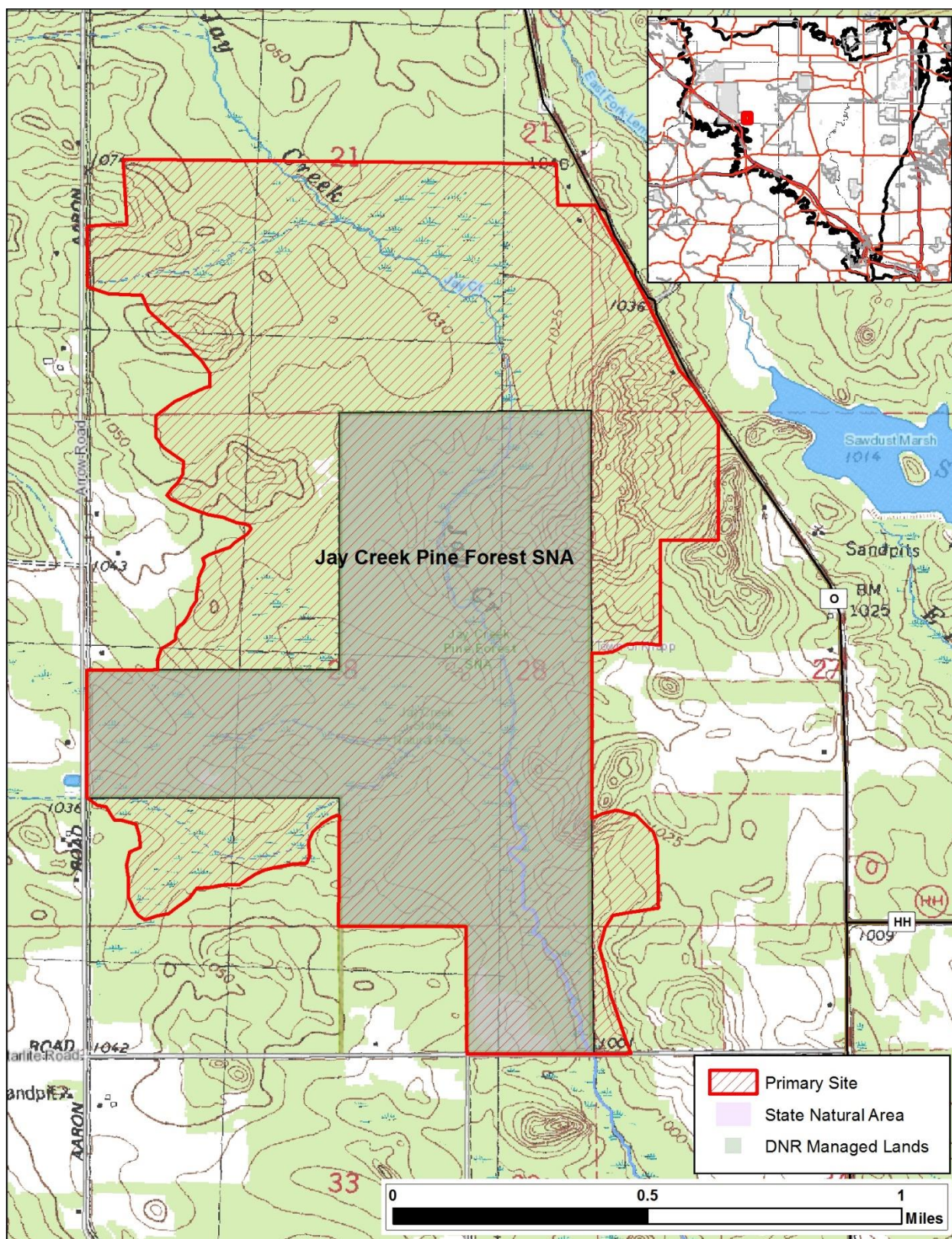
[Jay Creek Pine Forest SNA](#) features mature forest on the flat, poorly drained bed of former Glacial Lake Wisconsin. The uplands are northern dry-mesic forest of white and red pine, red maple, and white oak, while the wetland features an exceptional white pine-red maple swamp on gently sloping wet sand along Jay Creek. Numerous seeps and springs occur in the swamp and supply cold water to the creek. Winterberry dominates the shrub layer with some blueberry, huckleberry, and alder present. The understory is dominated by expanses of cinnamon fern on a dense mat of Sphagnum moss with three-leaved gold-thread, American starflower, Canada mayflower, and yellow bluebead-lily. Jay Creek is a fast, cold soft water stream inhabited by brook trout.

### **Significance of Site**

The site harbors one of the highest quality white pine-red maple swamps in the state, featuring large trees (up to 40" in diameter), complex forest structure, no invasive species, and abundant coarse woody debris in various stages of decay, a sign of old growth conditions. This community occurs almost exclusively in the Central Sand Plains. The site features a diverse suite of breeding birds including a state-threatened species, uncommon breeders (yellow-billed cuckoo, wood thrush, Canada warbler) and several species found at the southern edge of their range in the state. Another rare bird nested in the site in the 1980s. A rare dragonfly is known from the creek. The site lies within the Meadow Valley Sandhill COA, of upper Midwest significance for barrens and wetlands. Jay Creek Pine Forest is also a Wetland Gem, representing a high-quality example of this wetland type in the region (Wisconsin Wetlands Association 2009).

### **Management Considerations**

A portion of the site was selectively harvested in 1950 to salvage large wind-thrown white pine. Future harvests are not recommended in the SNA given the relative lack of large, mature white pine across the Central Sand Plains and rarity of high-quality white pine-red maple swamps. Coarse woody debris from large fallen trees is also an important ecological attribute, serving as a seed bed for yellow birch and habitat for salamanders and a host of invertebrates. The boundary of the primary site follows the state project boundary and includes nearly an additional 500 acres of good quality upland and wetland forest that is currently in private ownership. Given the apparent lack of invasive species in the swamp, periodic monitoring is recommended, especially for species such as glossy buckthorn. Invasive monitoring and control could also be extended to include adjacent willing landowners for further protection of the site.



CSPEL02. Jay Creek Pine Forest SNA Primary Site

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## CSPEL03. MILL BLUFF SNA

### **Location**

Property:	Mill Bluff State Park
Landtype Association:	Tomah-Mauston Terraces (222Ra09) and Trempealeau Sandstone Hills (222Lb07)
Approximate Size:	529 acres (485 within current SNA boundary)

### **Description of Site**

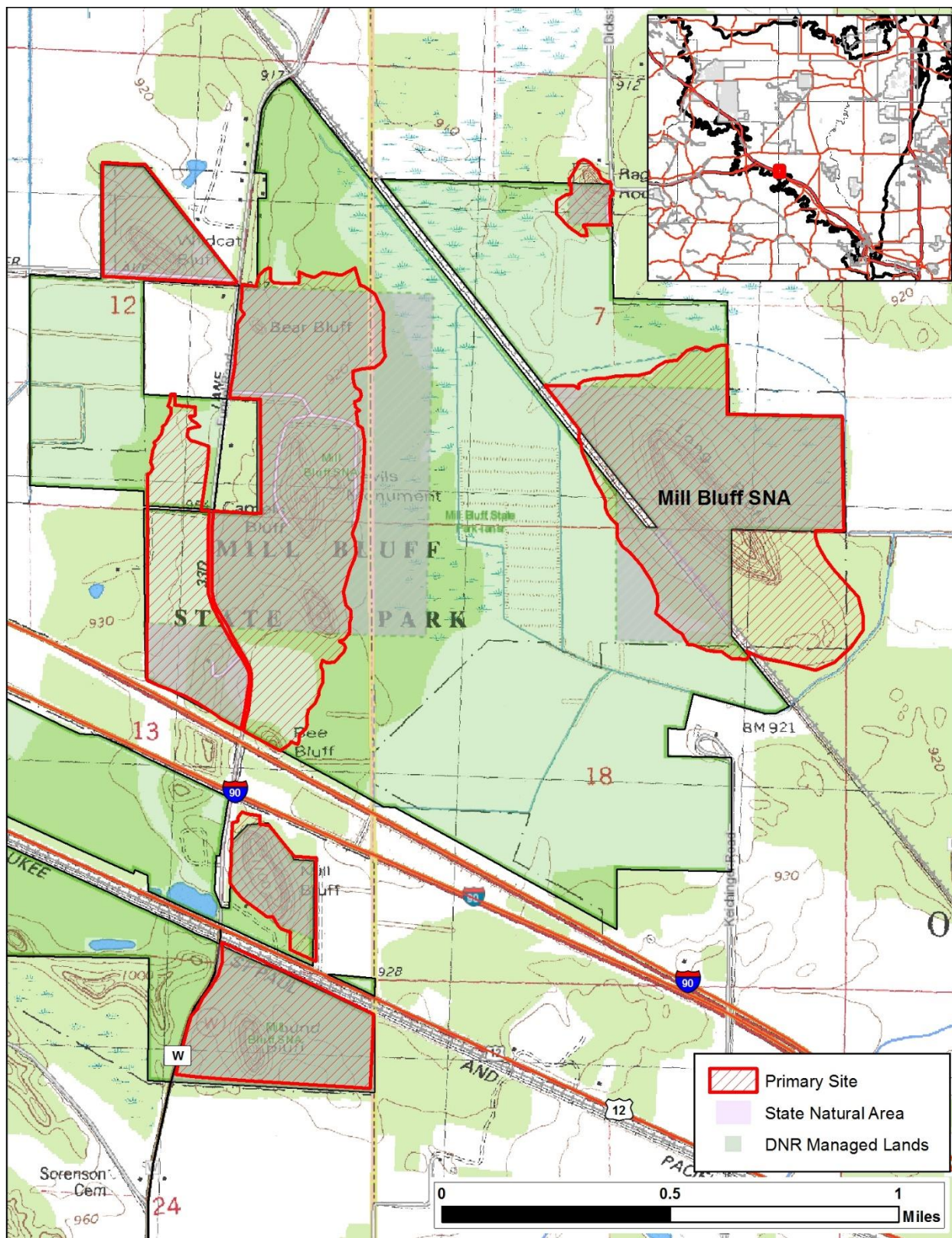
[Mill Bluff State Natural Area](#) features a number of spectacular Cambrian sandstone mesas, buttes, and pinnacles that rise above the level bed of extinct glacial Lake Wisconsin. Long Bluff, Ragged Rock, Wildcat Bluff, Bear Bluff, Devil's Monument, Bee Bluff, Camel's Bluff, Mill Bluff, and Round Bluff are all included within the site. Many of the area bluffs contain petroglyphs that date back to Upper Mississippi Indian culture about 400 years ago. The dominant plant community is a Central Sands pine-oak forest composed primarily of Hill's oak, Jack pine, red pine, white pine, and white oak. Many of the sandstone outcroppings feature dry cliffs and large red pine on rock outcrops. On Long Bluff, the dominance of different trees varies according to aspect, with oak and pine more prevalent on the western and southern exposures while red maple is more common on the east side of the bluff, especially on the lower slopes. Low shrubs including early low blueberry, huckleberry, and sweet gale. Small areas of degraded oak barrens occur on flat sandy areas, particularly below Long Bluff. Scattered dry prairie plants are also present along an abandoned railroad grade and in old fields adjacent to the campground.

### **Significance of Site**

Mill Bluff is notable for the large collection of Cambrian sandstone bluffs, along with the dry cliffs and uncommon plants they support, including a rare club-moss. It also hosts one of the more northeastern populations of cliff goldenrod (*Solidago sciaphila*). While not tracked as a rare species, this plant of dry cliffs is found only in and adjacent to the Driftless area. The site also harbors a rare plant of dry prairies. A rare butterfly historically occurred on the site, as well as a rare wetland plant, but neither have been observed in several decades despite surveys for them. Two special concern bird species were observed here – one associated with oak barrens, one with upland forest. The south portion of the primary site lies within the Green Sand Cuesta COA, of continental significance for its sandstone bluffs (WDNR 2008). Mill Bluff was designated a State Natural Area in 2002.

### **Management Considerations**

The Central Sands pine-oak forest contains pockets of prairie and barrens plants, and portions of the site around Camel Bluff are being managed to restore oak barrens by harvesting timber. However, red maple is common in the subcanopy and sapling layer and conversion to a young, closed-canopy maple forest is possible without follow-up treatment such as herbicide or repeated prescribed burning. Much of the site, including the prairie and barrens areas, are being invaded by trees and brush and would also benefit from prescribed fire. Glossy buckthorn is common across the State Park, particularly in the wetlands between Camel Bluff and Long Bluff. It is also present in the upland forest as well as on the bluff tops themselves. Aggressive and strategic control measures are needed to protect the highest quality portions of the site including the bluffs and adjacent pine-oak forests. Dense garlic mustard is found near old buildings west of Funnel Road. While not a high-use park, recreation impacts are evident in some areas, including volunteer trails leading up some of the bluffs causing erosion. Finally, the SNA boundaries could be revised to the most ecologically significant areas, including contracting in some areas and expanding in others.



**CSPEL03. Mill Bluff SNA Primary Site**

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## CSPEL04. CRANBERRY CREEK MOUND GROUP SNA

### ***Location***

Property: Cranberry Creek Mound Group SNA  
Landtype Association: Wisconsin River Outwash Terraces (222Ra07)  
Approximate Size: 667 acres (all in current SNA boundary)

### ***Description of Site***

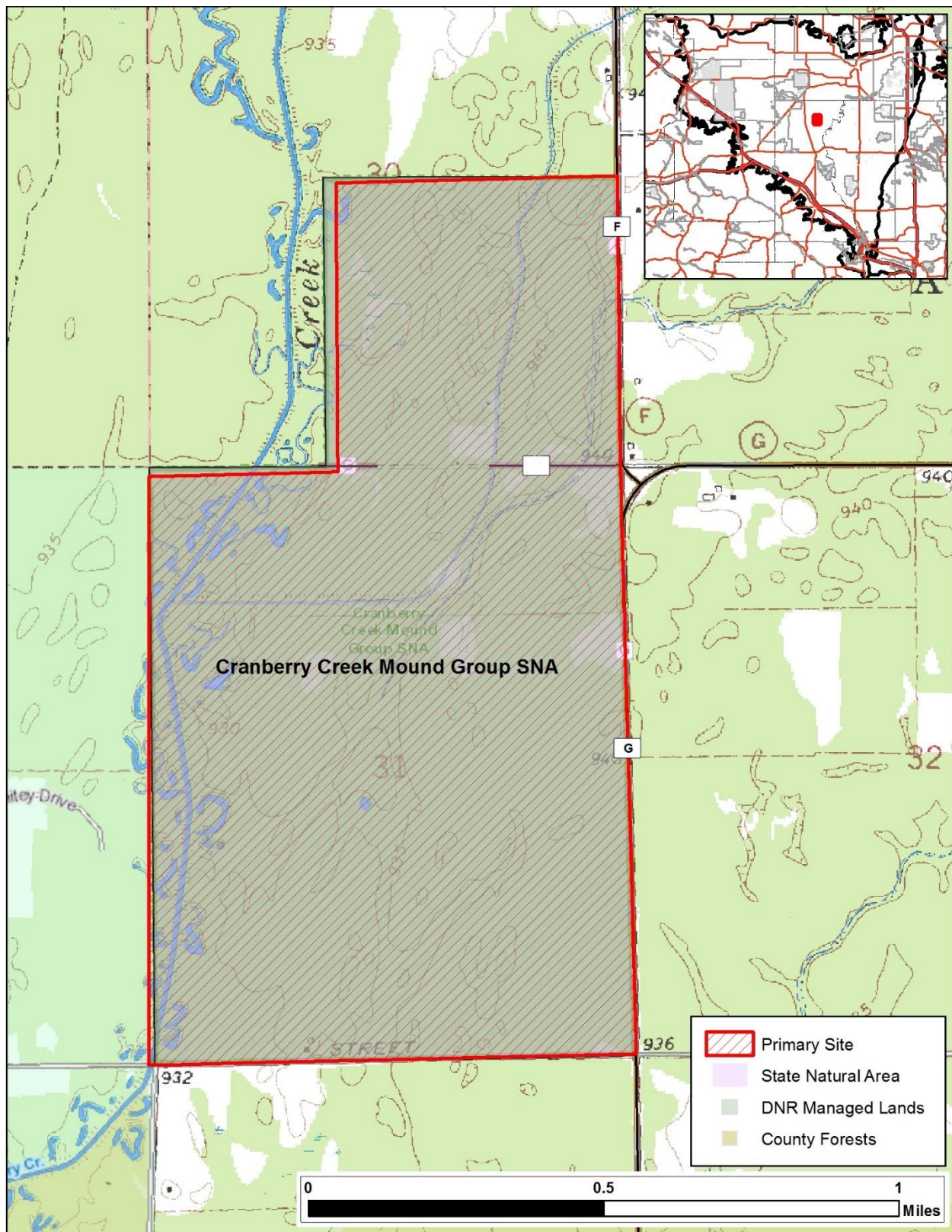
[Cranberry Creek Mound Group SNA](#) preserves one of the most significant archeological sites in Wisconsin and one of the largest and best-preserved mound complexes in the Upper Midwest. The site contains excellent examples of conical, linear, oval, and effigy mounds built by Native Americans of the Woodland period (ca. 100-800 A.D.). Among the mounds featured are bear/panther mounds and a 50-foot-long bird effigy mound with a wingspan of 125 feet. The site also contains a diversity of natural communities. Along the ditched channel of Cranberry Creek, large river birch and silver and red maples dominate the floodplain forest. The uplands contain a Central Sands pine-oak forest of varying seral stages and canopy densities, ranging from closed-canopy to relatively open barrens. The uplands are occasionally interspersed with small peaty depressions. A few old pine plantations are also present, many in various states of restoration to more natural forest or barrens.

### ***Significance of Site***

The site has been known as a significant archeological area for over 100 years. Since 1917, archaeological investigations of mapping and interpretation have been conducted and the site is part of a larger complex of preserved and protected mounds located in adjacent and nearby areas. One rare plant of wetlands and barrens is known from the property. Cranberry Creek Mound Group was designated a State Natural Area in 1986.

### ***Management Considerations***

Tree and brush encroachment on the mounds is the biggest management issue. Recent work has been conducted to clear young trees and shrubs, but this will remain a long-term management challenge. Portions of the site contain several barrens flora indicators including lupine, big bluestem, and round-headed bush-clover. Prescribed burning would be beneficial if deemed feasible and a priority. Fire could also be used to maintain mounds in an open condition and was likely historically used by Native Americans who formerly occupied the site. Invasive species are uncommon, but one small patch of glossy buckthorn was noted in the floodplain forest. While the patch was treated, follow-up monitoring and more thorough surveys along the floodplain are recommended. A rare herptile was previously documented just west of the property and could occur on the property.



**CSPEL04. Cranberry Creek Mound Group SNA Primary Site**

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## CSPEL05. ROCHE-A-CRI MOUND AND WOODS SNAS

### **Location**

Property:	Roche-a-Cri State Park
Landtype Association:	Adams County Bluffs (222Ra10) and Wisconsin River Outwash Terraces (222Ra07) and Glacial Lake Wisconsin Sand Dunes (222Ra06)
Approximate Size:	606 acres (464 within current SNA boundaries)

### **Description of Site**

[Roche-a-Cri Mound SNA](#) encompasses a late Cambrian sandstone outlier mesa of the retreating Magnesian Escarpment. The distinctly shaped mound was once a rocky island in the former Glacial Lake Wisconsin and is long and narrow with a flat-topped ridge bordered by craggy, precipitous cliffs. The summit stands about 240 feet above the Central Sands plain. Vegetation at the top of the mound consists of scattered red, black, and white oak with red, white, and jack pine. Plants characteristic of cliff and northern dry forest are common. Below, lies a long and steep talus slope, which harbors a small, narrow rock shelter containing rock art.

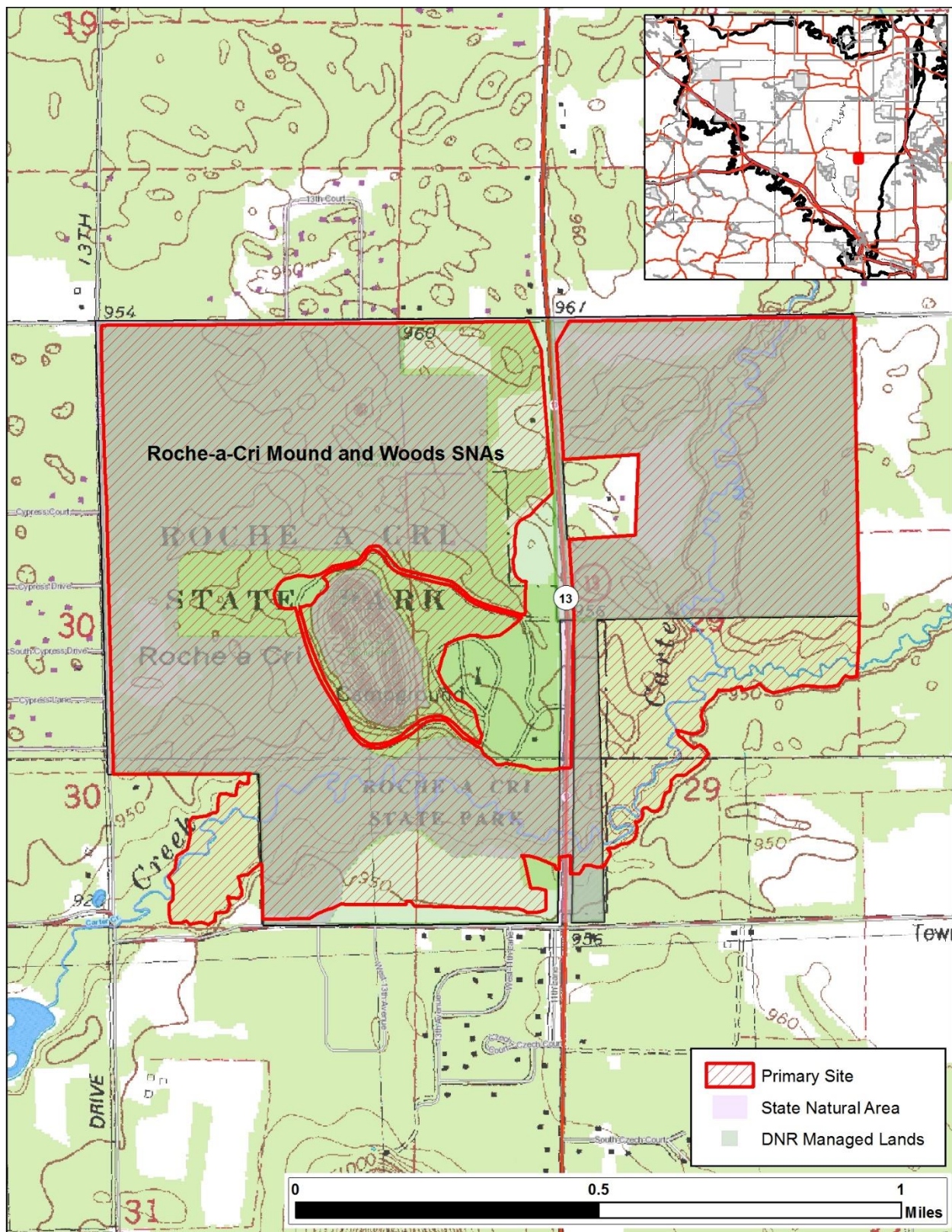
[Roche-A- Cri Woods SNA](#) features a mature pine-oak forest in the fire shadow of Carver Creek and Roche-a-Cri Mound. The forest is dominated by large white pine, red oak, white oak with subcanopy of white oak, white pine and red maple. The groundlayer is dominated by Penn sedge and bracken fern with barrens plants occurring along trails and in small openings. Forest herbs also common, especially in draws and toward creek. To the south, the uplands grade abruptly into floodplain forest associated with Carver Creek and to the west, into degraded oak barrens, some of which are undergoing restoration. A high-diversity planted prairie lies to the south.

### **Significance of Site**

The site is most significant for the mound and associated petroglyphs. The associated natural communities are also relatively high in quality, particularly the natural-origin red pine forest associated with the mound, the mature Central Sands pine-oak forest south of the mound, and the floodplain forest, all of which are uncommon in the Central Sands region and noteworthy here for their high ecological integrity, stemming from their maturity, complex multi-layered canopy, and relative lack of invasive species. Several rare species have been documented on the site, including three birds of oak barrens/sand prairie and two rare butterflies, including one that is federally endangered. A rare plant was also found in the floodplain forest over 60 years ago but has not been observed in recent surveys. Roche-a-Cri Mound was designated a State Natural Area in 1983, and Roche-a-Cri Woods was designated a SNA in 2002.

### **Management Considerations**

On the mound and in the floodplain forest, managing non-native invasive species is the primary need. A variety of invasives are present, including Japanese barberry and honeysuckle. Common buckthorn also occurs in portions of the floodplain forest. It is especially important to control buckthorn before it takes over canopy gaps caused by emerald ash borer. Japanese hedge-parsley was found near the mound trail parking area, apparently being spread along the road by mowing or other maintenance equipment. In uplands, barrens restoration is ongoing through a combination of timber harvests and planned prescribed burns. Including portions of the pine-oak forest south of the mound in burn units would be beneficial to encourage suppressed barrens flora. Areas north and east of the mound also show good potential for barrens restoration based on pockets of prairie grasses, barrens forbs, and a partially open canopy. The SNA boundary should be adjusted to include additional good-quality areas.



**CSPEL05. Roche-a-Cri Mounds and Woods SNAs Primary Site**

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## CSPeL06. QUINCY BLUFF AND WETLANDS AND SOHLBERG SILVER LAKE SNAS

### **Location**

Property: Quincy Bluff and Wetlands  
Landtype Associations: Adams County Bluffs (222Ra10),  
Glacial Lake Wisconsin Sand Dunes (222Ra06),  
Wisconsin River Alluvial Plain and Flowages and Terraces (222Ra01),  
Wisconsin River Outwash Terraces (222Ra07)  
Approximate Size: 10,310 acres (6,831 within current SNA boundaries)

### **Description of Site**

[Quincy Bluff and Wetlands SNA](#) is a large, landscape-scale natural area featuring a mosaic of communities including northern tamarack swamp, central poor fen, southern sedge meadow, shrub-carr, oak barrens, Central Sands pine-oak forest, and dry cliff. This unique area features a vast wetland complex with low sandy ridges, wetlands, and seepage lakes situated between sandstone mesas and buttes that rise 100-200 feet. Quincy Bluff, which rises 200 feet high and extends for approximately two miles, contains Central Sands pine-oak forest and open cliff communities. Lone Rock, an excellent example of a Driftless Area mesa, features one hundred-foot Cambrian sandstone cliffs. Portions of the area were struck by a tornado in 2004, accelerating restoration to oak barrens with a sparse canopy of jack pine and Hill's oak and a shrub layer dominated by huckleberry, American hazelnut, and early low blueberry. Pennsylvania sedge is the dominant herb with wild lupine and spreading dogbane common constituents of the understory. Grasses and forbs characteristic of barrens and sandy prairies are found here including big blue-stem, June grass, needle grass, poverty grass, goat's-rue, prairie coreopsis, and rough blazing-star.

[Sohlberg Silver Lake SNA](#) features a small seepage lake nestled in a landscape of undulating topography with low wooded hills and scattered open bogs and tamarack swamps just northwest of Quincy Bluff. The shallow lake has very soft, alkaline water and is moderately transparent. The fluctuating shoreline is dependent upon the local water table and the lake occupies anywhere from 7 to 16 acres depending on annual precipitation. These seasonal and yearly fluctuations maintain a coastal plain marsh featuring sandy and muck shores in a relatively open condition that harbor several rare plants more commonly found along the Atlantic coastal plain. On the adjacent uplands grows an even-aged dry forest of scrubby oak and jack pine while surrounding lowlands contain a central poor fen and tamarack swamp.

### **Significance of Site**

Due to its vast size, low amount of fragmentation, mosaic of diverse and intact habitats, and high ecological integrity, Quincy Bluff and Wetlands contains essential habitat for a great diversity of plant and animal species, many of which are rare. These include three dragonflies, one butterfly, one tiger beetle, one mammal, two herptiles, and eleven rare plants. In addition, oak barrens and coastal plain marsh are globally rare natural communities. The site comprises the Quincy Bluff and Wetlands COA, of upper Midwest significance for its large sedge meadows, central poor fens, and oak barrens. It is also designated as an Important Bird Area due to its importance to birds of both wetland and oak barrens habitats, including northern harrier, sandhill crane, whip-poor-will, red-headed woodpecker, willow flycatcher, brown thrasher, sedge wren, blue-winged warbler, field sparrow, swamp sparrow, and bobolink. Sandhill cranes can be found staging in the sedge meadows in the fall, and golden eagles occur in winter. Wetlands within the primary site are designated as a Wetland Gem by Wisconsin Wetlands

Association (2009) high-quality sedge meadows and central poor fens. Quincy Bluff and Wetlands was also awarded the highest level of 'conservation significance' in the Land Legacy Report (WDNR 2006). In addition, Silver Lake was identified as an important conservation target in The Nature Conservancy's Lake Conservation Portfolio (Blann and Wagner 2014). Quincy Bluff was designated a State Natural Area in 1993. Sohlberg Silver Lake SNA was designated a State Natural Area in 1980. The primary site boundaries follow the current SNA project boundaries within which land can be acquired by the state.

## ***Management Considerations***

As one of the most significant oak barrens and wetland complexes in the state, the site has received significant management attention to restore oak barrens through the use of timber harvests and prescribed burning, focusing on the 2004 tornado area and adjacent stands. Invasive species control has occurred in various portions of the site, focusing on access lanes and trails. Wetland management, including controlling the spread of non-native invasive cat-tails, is also an important priority. Maintaining natural hydrology at Solberg Silver Lake is also crucial to protecting the rare coastal plain marsh.

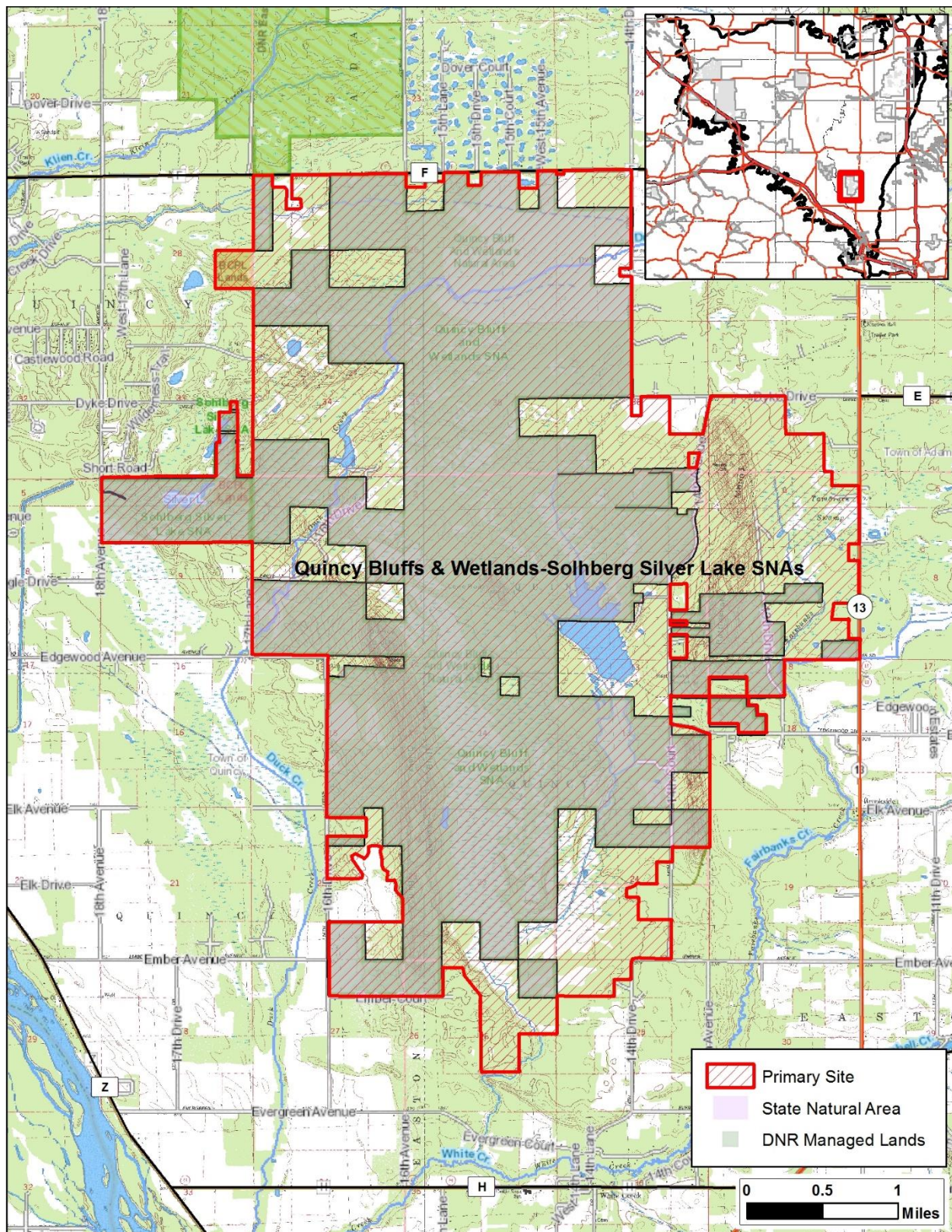
Based on the current Interim Forest Management Plan for the site, the overall site objectives are to manage for the long-term perpetuation of a largely open, native community landscape, including a vast wetland complex with low sandy ridges, seepage ponds situated between sandstone mesas and buttes that rise 100-200 feet, and sandy uplands between the mesas (WDNR 2014b).

Forest management objectives are to restore and enhance the full range of barrens seral stages, from very open barrens to oak woodland, as well as some areas with old-growth characteristics, and finally, early successional stages that would be maintained by timber harvests.

Specific objectives for oak barrens/sand prairie include a few scattered trees and many oak grubs with abundant prairie/prairie-like vegetation. Old fields would be planted to a diverse sand prairie mix. Areas currently forested would have extensive timber harvests, replacing timber with short grubby wooded areas, scattered larger trees and regular 4-7 year fire management cycles.

Specific objectives for oak-pine barrens are for a classic savanna-like canopy structure, with a 10-50% canopy closure composed mostly of oak, especially favoring the white oak group. The canopy would also contain jack pine. Areas currently forested would be extensively thinned, preferably with a whole tree (biomass) harvest operation, then followed with occasional 8-15 year burns and ground layer species augmentation.

Management objectives for oak woodland areas are for stands to have 50-90% canopy cover with very few saplings and poles present and a few scattered patches of short-statured shrubs. The composition would be mostly oaks, favoring the white oak group, and several white pines with a few jack pines. Areas forested would be thinned from below, removing mostly poles and smaller canopy trees. These areas would receive low-intensity burns approximately every 20 years. Some groundlayer augmentation may occur.



**CSPEL06. Quincy Bluffs and Wetlands and Sohlberg Silver Lake SNAs Primary Site**

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## CSPEL07. BROOKS BLUFF SNA

### ***Location***

Property: Brooks Bluff SNA  
Landtype Association: Adams County Bluffs (222Ra10)  
Approximate Size: 26 acres (20 within current SNA boundary)

### ***Description of Site***

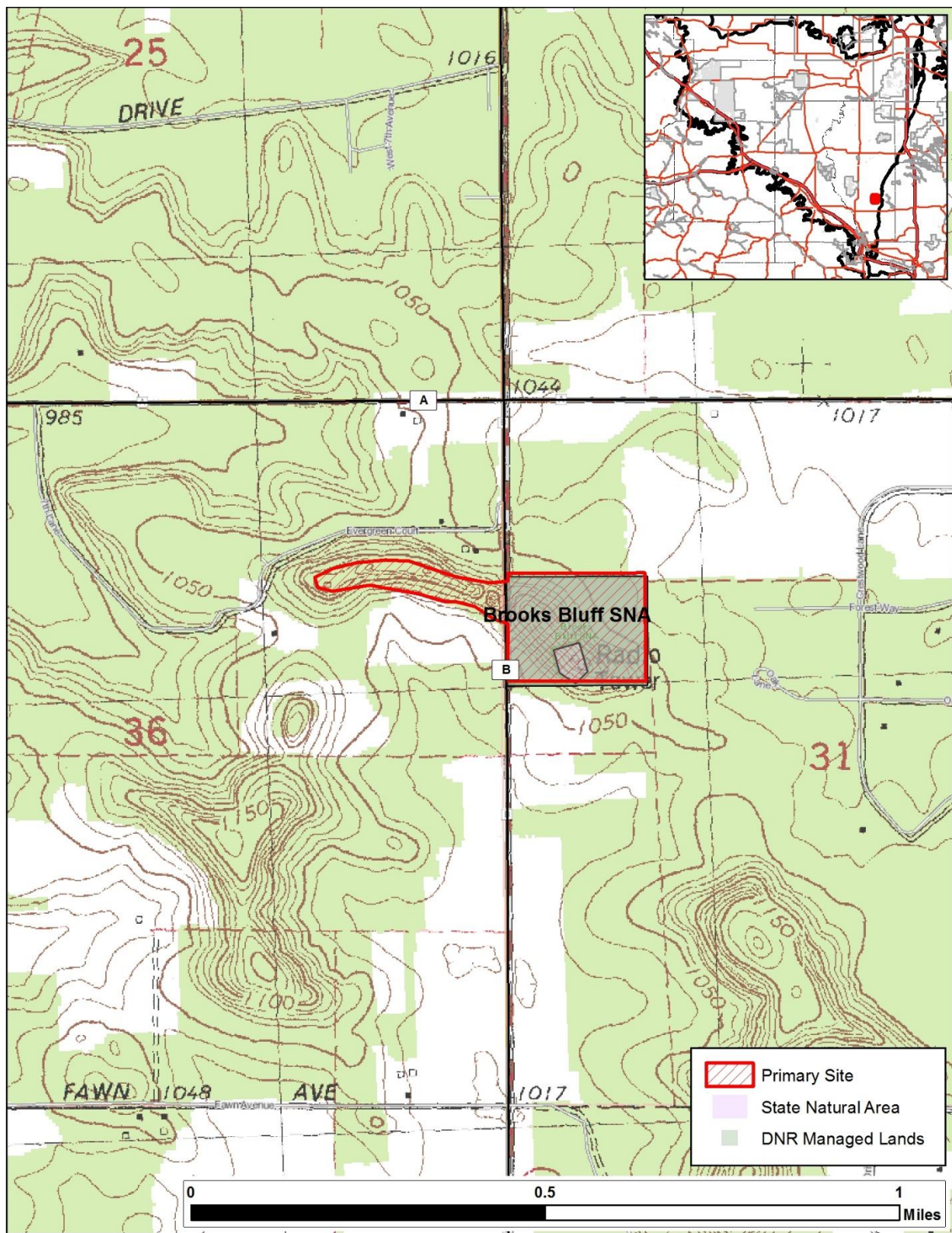
[Brooks Bluff SNA](#) lies on the south-facing slope of an east-west trending mesa and contains oak barrens. The bedrock is near the surface and is composed primarily of sandstone, although there is also a thin limestone cap. The bluff summit is mostly open with scattered oaks, white birch, and common juniper. The oak barrens is dominated by grasses such as big and little blue-stem, Indian grass, needle grass, and grama grasses, and typical dry prairie forbs such as azure aster, four species of milkweed, prairie coreopsis, alumroot, sunflowers, rough blazing-star, wild lupine, wood betony, and goldenrods. The remainder of the slope is forested with an oak woods. A former communications and look-out tower also occurs at the summit of the mound on a small parcel not owned by the WDNR.

### ***Significance of Site***

This site harbors many rare plants, including a state endangered species of cliffs and barrens known from only three sites in the state. Two other rare plants of dry prairies and barrens also occur here, while two additional species have been found in the past. A state endangered herptile has also been found here historically. While the oak barrens that occur on the site are small in acreage, the flora is quite diverse. In addition, oak barrens are a globally rare community. Brooks Bluff is owned by the DNR and was designated a State Natural Area in 1990.

### ***Management Considerations***

Prescribed fire is needed to control brush and trees rapidly encroaching on the oak barrens and rare plants, though the non-DNR tower parcel presents a management challenge to burning. Some manual cutting or harvesting of low-quality timber would also likely be necessary to restore the barrens. This site has limited opportunities for large-scale barrens management due to its small size, however, the site may present a good opportunity for volunteer stewardship. The portion of the primary site west of County Road B is privately owned but likely contains significant populations of a rare plant. Should surveys confirm its presence there, coordinated management and permanent protection through acquisition or easement could help in securing this population.



**CSPEL07. Brooks Bluff SNA Primary Site**

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## CSPeL08. LEMONWEIR BOTTOMLAND HARDWOOD FOREST SNA

### ***Location***

Property:	Lemonweir Bottomland Hardwood Forest SNA
Landtype Association:	Lemonweir Floodplain and Terraces (222Ra15) and Wisconsin River Alluvial Plain and Flowages and Terraces (222Ra01)
Approximate Size:	1301 acres (323 within current SNA boundary)

### ***Description of Site***

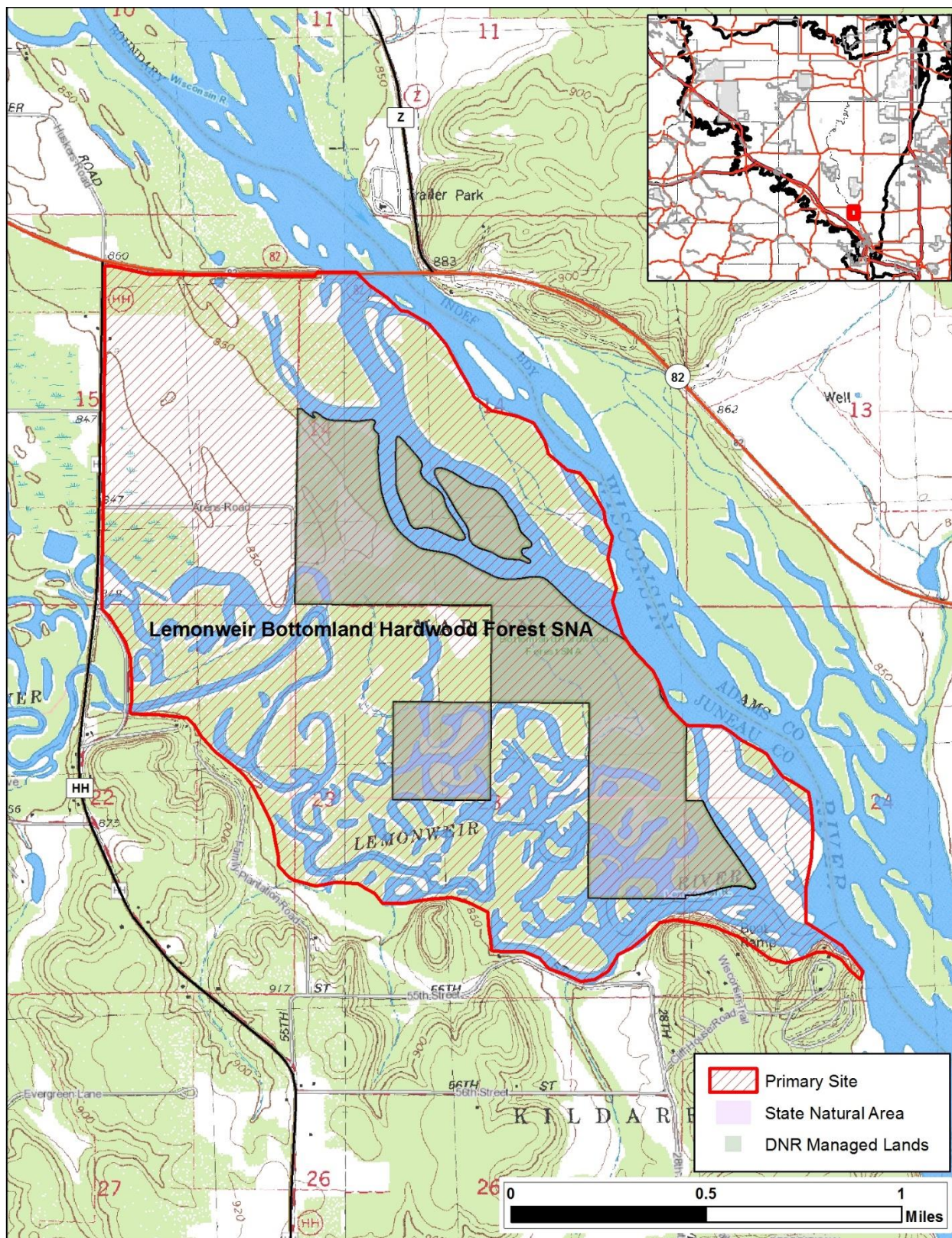
[Lemonweir Bottomland Hardwood Forest SNA](#) is located at the confluence of the Wisconsin and Lower Lemonweir Rivers and is an expanse of floodplain forest of silver maple, river birch, green ash, swamp white oak, hackberry, and cottonwood. The extensive forest is laced with swales, running sloughs, and oxbow lakes. The forest is maturing and developing old-growth structural attributes such as large trees, standing snags, tip-up mounds, and downed coarse woody debris. The understory is diverse with an assemblage of native grasses and sedges, gray-headed coneflower, and wood nettle. Thickets of buttonbush and dogwood border many of the open swales. Uplands northwest of the current SNA boundary feature large blocks of planted grassland.

### ***Significance of Site***

The site features a diverse and complex series of islands, sloughs and backwaters at the confluence of two river systems. The site provides important breeding and migratory habitat for many rare and declining birds. The floodplain forest is high in ecological integrity and supports several rare forest interior birds and a rare plant. Another rare bird is found in grasslands at the site. Finally, sandstone cliffs at the southern portion of the site host at least two rare plants. The Lemonweir River aquatic COA, of state significance for its diverse aquatic communities, spans the site. Lemonweir Bottomland Hardwood Forest was designated a State Natural Area in 2003.

### ***Management Considerations***

Grasslands in the northwest portion of the site should be maintained in an open condition. A red pine plantation lies between several grassland patches but in 2019 was in the process of being removed and restored to prairie. In the floodplain, the primary management need is to maintain forested condition and prevent takeover by reed canary grass. This is especially important in pockets with abundant green ash in the canopy, which is expected to die from emerald ash borer, creating canopy gaps. Proactively underplanting these areas with other, desirable species such as swamp white oak will help limit reed canary grass expansion and maintain a diverse, multi-layered floodplain forest canopy.



**CSPEL08. Lemonweir Bottomland Hardwood Forest SNA Primary Site**

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## CSPeL09. DELLS OF THE WISCONSIN RIVER AND BLACKHAWK ISLAND SNAS

### **Location**

Property:	Dells of the Wisconsin River SNA, Upham Woods Outdoor Learning Center
Landtype Association:	Wisconsin Dells (222Ra01) and Wisconsin River Outwash Terraces (222Ra07)
Approximate Size:	1705 acres (1386 within current SNA boundary)

### **Description of Site**

[Dells of the Wisconsin River SNA](#) encompasses over 5 miles of Wisconsin River corridor with a spectacular gorge, cliffs, tributary canyons, and rock formations carved into Cambrian sandstone. Formed between 510-520 million years ago, some cliffs rise over one hundred feet above the water and have been shaped by the erosive processes of water and wind. This area contains a mosaic of plant communities including Central Sands pine-oak forests and moist and dry cliffs.

[Blackhawk Island SNA](#) is a wooded island in the Wisconsin River owned by the University of Wisconsin system and is surrounded by the Dells of the Wisconsin SNA. The site features diverse upland forest types and cliffs with rich floras at the Dells of the Wisconsin River. The terrain is varied, consisting of ridges, gorges, cliffs, rock outcrops, and some level ground. The island is diverse and features several community types with white oak, red oak, white pine, sugar maple, basswood, hemlock, white cedar, yellow birch, river birch, cottonwood, and red maple. The numerous gorges provide unique habitats. The groundlayer of the island is especially rich in ferns with nearly one-third of Wisconsin species present.

### **Significance of Site**

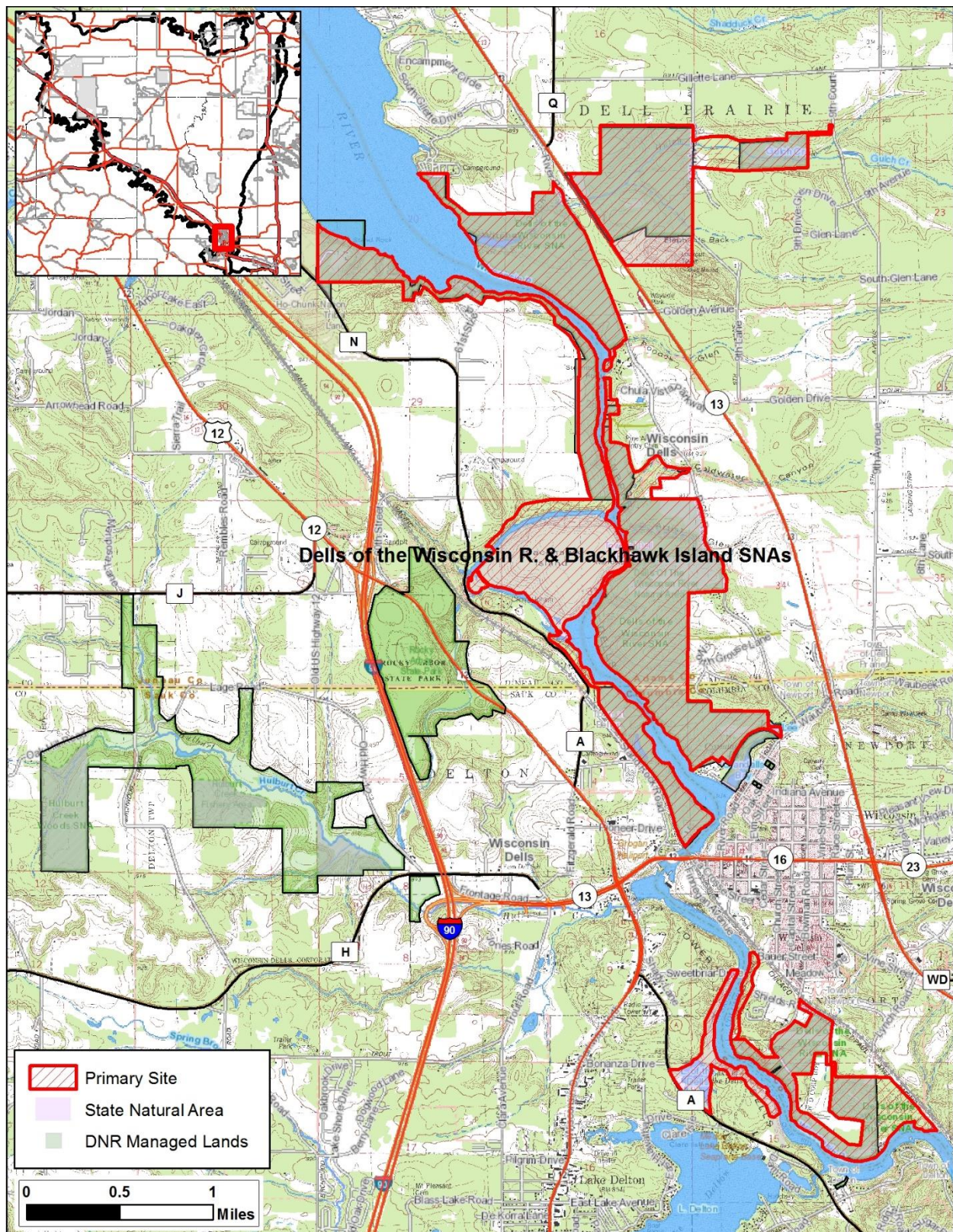
The Dells of the Wisconsin feature some of the most spectacular riverine rock exposures in Wisconsin. With a variety of exposures and moisture regimes, the cliffs afford many different niches for plants, including one species known from only two places in the world. - here and in the Kickapoo Valley. An additional ten rare plants have been found here, including two species that have their largest populations in the state in the Dells. Rare animals include at least eleven species, many of which are state endangered or state threatened, including mussels, fish, herptiles, a bird, and one invertebrate.

While set aside to protect the rare plants and animals, the Dells also has an important cultural history that spans several thousand years. Various Native Americans, ranging from early Paleo-Indian people to the more recent Ho-Chunk, Sac, and Menominee, were attracted to the scenic waterway, and left behind archeological evidence such as effigy and burial mounds, camps and village sites, garden beds and rock art. The site is part of the Wisconsin-Baraboo Rivers Aquatic COA, of upper Midwest significance for its aquatic diversity. Dells of the Wisconsin was designated a State Natural Area in 1994, while Blackhawk Island was designated a State Natural Area in 1969.

### **Management Considerations**

Managing invasive species is the primary management need. Several problematic species were noted, particularly in the Lower Dells. These included a patch of Japanese knotweed along the river, patches of garlic mustard, and open cliffs and rocks being invaded by Russian stonecrop (*Sedum kamtschaticum*), apparently naturalizing and spreading from adjacent landscaping at the top of the cliffs. The pine-oak forest is being degraded by an over-abundance of white pine encroachment and lack of red pine and oak

regeneration and would benefit from occasional prescribed fire, but management would be exceptionally difficult given the proximity to development, resorts, and tourism operators. Most upland areas of the Dells SNA and Blackhawk Island are closed to the public and accessible only via tours for the protection of visitors, maintenance of scenic features that support local tourism, and for the protection of the globally rare plant species that occur here. One of the rare plant species appears to be in severe decline, possibly due to severe droughts, and conservation measures could be considered for its propagation and re-establishment at a more resilient habitat niche at the site. Finally, the area has been subject to increasingly destructive extreme rain events, including a 2008 deluge that caused Lake Delton to burst and drain through a portion of Lower Dells, apparently wiping out another rare plant population. Any management or conservation measures for rare species should consider the impacts of extreme rainfall and drought on long-term success, with a focus on accepting and adapting to change.



**CSPEL09. Dells of the Wisconsin River and Blackhawk Island SNAs Primary Site**

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## **CSPeL10. BLACK RIVER STATE FOREST PALM ROAD BARRENS**

### ***Location***

Property: Black River State Forest  
Landtype Association: Black-Robinson-Harrison Terraces and Floodplains (222Ra20)  
Approximate Size: 233 acres

### ***Description of Site***

Palm Road Barrens features a large complex of pine barrens on relatively level outwash sands. Plant diversity in the barrens is very high relative to other areas on the Black River State Forest and the site supports numerous rare species. The site includes both partially closed-canopy areas dominated by jack pine and black oak as well as more open brushy areas with jack pine, black oak, and locally dense American hazelnut and blackberry. Two stands have been managed to maintain open habitat for rare butterflies. One stand in the northeast portion of the primary site was harvested in 2016 and scarified to promote jack pine regeneration, and is currently a mix of sparse jack pine, locally dense oak resprouts and hazelnut. Barrens indicator plants are common across the site including species such as sky-blue aster, New Jersey tea, hoary puccoon, prairie coreopsis, rough blazing star, cylindrical blazing star, showy goldenrod, white goldenrod, stiff goldenrod, and western sunflower. Prairie grasses are also common in openings, including big bluestem, little bluestem, Indian grass, poverty oats, and Kalm's brome.

This site includes an old homestead being maintained as a wildlife opening as well as a large firebreak running east-west. It is bisected by Palm Road where it runs north-south and is bounded to the north where the road turns east-west. The roadside also supports particularly diverse prairie flora.

### ***Significance of Site***

Palm Road Barrens features one of the larger pine barrens complexes on the Black River State Forest. Although vegetation structure and stand management history is variable, the area supports numerous barrens indicator species, indicating a high level of ecological integrity (O'Connor et al. 2019) and high restoration potential from a statewide perspective. The site lies within the Black River COA, of global significance for pine-oak barrens which support numerous rare species. Black River State Forest is also a Land Legacy Place (WDNR 2006). Rare species present within Palm Road Barrens include two plants, including one of the largest populations in the region for one of these barrens species. Several rare butterflies are also known from the site. Overall, this site has characteristics of an ecological reference area and could be considered for state natural area designation.

### ***Management Considerations***

High-quality pine barrens are a globally imperiled natural community (global rank of G2) and should receive special consideration for both protection and management as well as from a forest certification standpoint. Pine barrens are also a Wildlife Action Plan priority for the Central Sand Plains Ecological Landscape. In addition, the site ranks as average to above average for climate resiliency and above average for local connectedness from an ecoregional perspective due to its good landscape context and subtle but important topographic heterogeneity, which provide a variety of local microclimate niches which allows species to shift within sites (Anderson et al. 2018, The Nature Conservancy 2019). While pine barrens are anticipated to be moderately vulnerable to climate change (WCCI 2017), they may fare best in large, less fragmented landscapes, such as the Black River State Forest, that allow species to move

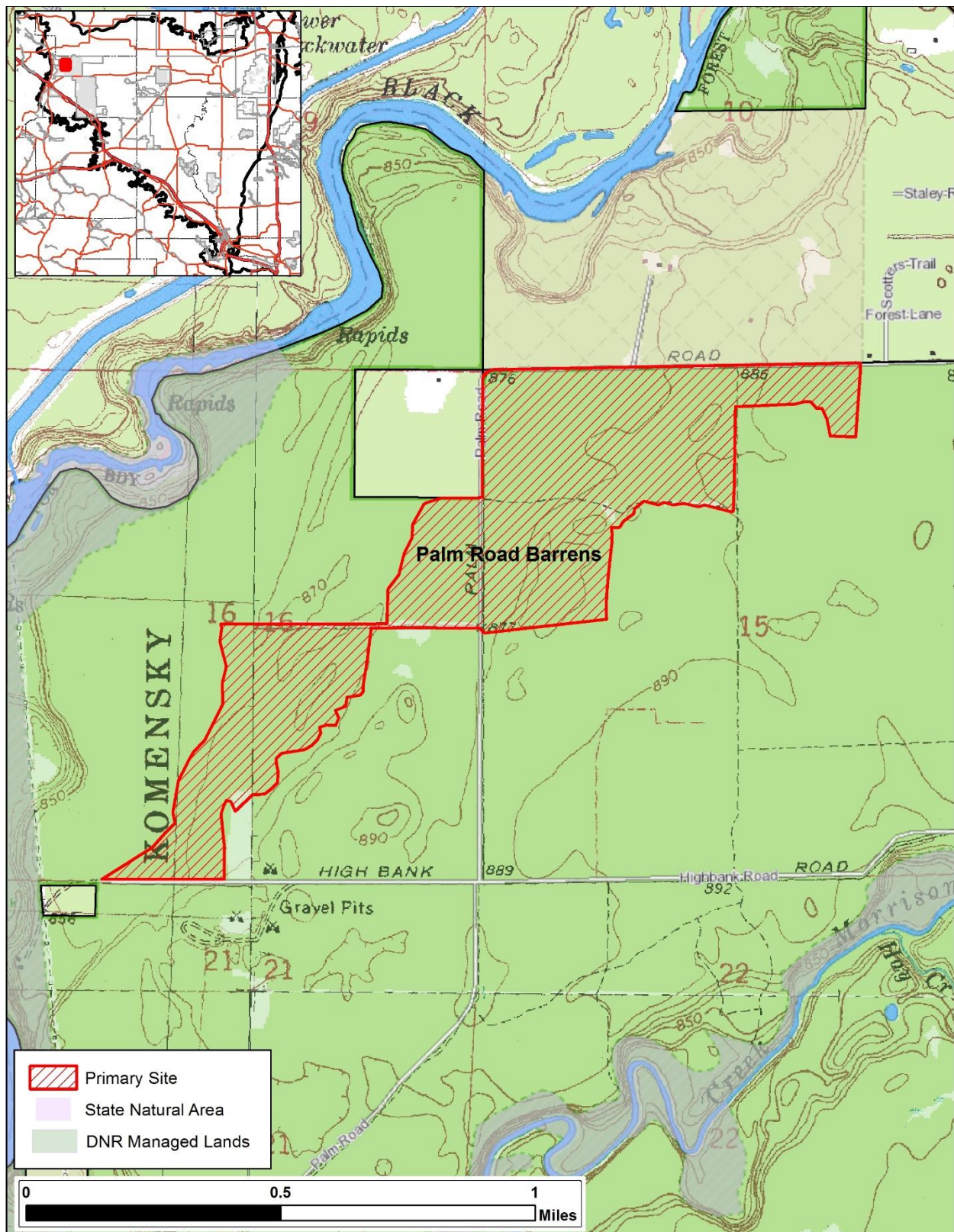
locally within and between sites as environmental conditions change. Fire can also play an important role in climate resiliency by stimulating drought tolerance in pine barrens species (Cavender-Bares and Reich 2012). Positive impacts of fire will be maximized when applied at larger scales.

Management to date has been local in scale, including small scale timber harvests, local herbicide treatments to reduce brush, local scarification to promote jack pine regeneration, and wildlife opening maintenance around the old homestead. Managing to promote pine barrens structure (O'Connor et al. 2019) including a more open canopy and less brush, is recommended. Shifting management from smaller to larger scales would be beneficial, such as developing a "rolling barrens" plan that maintains a large, central core that is maintained in a relatively open condition bordered by large blocks that are managed for timber in successive stages, such that in any given decade, the open core is bordered by a relatively young and open management block, several blocks of intermediate age, and a more mature block. As management progresses over time, the location of surrounding younger and more open stands shifts while the total acreage of open and more closed canopy habitat is maintained, providing larger blocks of open habitat for at-risk species while minimizing small-scale intensive management efforts.

This type of management is consistent with the current Black River State Forest master plan designation of a Jack Pine Habitat Management Area (WDNR 2010a). Area-specific resource management prescriptions from the master plan include:

- Actively manage jack pine stands primarily through clearcutting, using a shifting mosaic methodology which distributes harvests through the area to provide a wide age class distribution. Use a variety of regeneration techniques such as natural, direct seeding, planting, seed trees, and prescribed fire.
- Identify and designate high quality barrens vegetation sites to be maintained as permanent openings. Periodically use prescribed fire, mechanical brushing, and selective use of herbicides.
- Identify high quality barrens vegetation sites to be maintained in conjunction with timber production. These sites may be incorporated into the Karner Blue Butterfly Management Plan.

Critical components of management include regular prescribed fire to maintain the open core, survey and treatment of invasive species, and avoiding the use of deep trench-planting and limiting broadcast herbicide use in order to minimize impacts on native barrens plants and rare lepidopterans. Roadsides and firebreaks are also important corridors for barrens plants and animals, and maintenance should avoid the planting of invasive species like bird's-foot trefoil and crown vetch, as well as minimize frequent or close-crop mowing.



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## **CSPeL11. BLACK RIVER STATE FOREST CEMETERY ROAD AND STAFFON ROAD BARRENS COMPLEX**

### ***Location***

Property: Black River State Forest  
Landtype Association: Black-Robinson-Harrison Terraces and Floodplains (222Ra20),  
Jackson Siliceous Sand Plain (222Ra19), Arbutus Uplands (222Rb04),  
Northwest Outlet Cranberry Bogs (222Ra04)  
Approximate Size: 2831 acres

### ***Description of Site***

Cemetery Road and Staffon Road Barrens features an extensive complex of pine barrens and stream corridors on relatively level outwash sands. The site stretches just west of Oxbow Pond southeast 6 miles to portions of the Jackson County Forest and north-south roughly between Morrison Creek and Hay Creek, and in the east north to Mollies Creek. The site is bisected and partially bordered by ATV trails.

Plant diversity in the barrens is very high relative to other areas on the Black River State Forest and the site supports numerous rare species. Pockets of exceptional quality pine barrens are intermixed with moderate quality areas with few indicator plants and more closed canopy conditions. Overall, the site contains a complex, multilayered canopy of jack pine, pockets of red pines, and black oak as well as brushy areas with oak and locally dense American hazelnut, mixed with blueberry, other low shrubs and a wide array of native barrens grasses and forbs. One stand just east of Cemetery Road was recently cut, herbicided, and trench planted to jack pine. Stands east of the correction camp were extensively salvaged in the mid-1990s following a jack pine budworm outbreak and remain in a relatively open condition. Barrens indicator plants are common throughout and floral diversity is relatively high, including grasses such as little bluestem, big bluestem, June grass, and poverty oats as well as forbs such as wild lupine, rough blazing star, cylindrical blazing star, goat's-rue, bird-foot violet, western sunflower, azure aster, short green milkweed, prairie bush clover, hairy puccoon, New Jersey tea, white goldenrod, showy goldenrod, and prairie coreopsis.

### ***Significance of Site***

This site features the largest pine barrens complex on the Black River State Forest and is likely one of the largest in the Central Sand Plains EL, as well as the state of Wisconsin. An exceptional number of indicator plant species are present, putting the site in the highest possible tier for this barrens ecological integrity metric (O'Connor et al. 2019). The site lies within the Black River COA, of global significance for pine-oak barrens which support numerous rare species. Black River State Forest is also a Land Legacy Place (WDNR 2006). Rare species present within the site include: four butterflies, two additional invertebrates, three birds, two reptiles, one small mammal and four plants. Notably, this site contains the largest population of the federally threatened Karner blue butterfly on the Black River State Forest. Overall, this site is of statewide significance as an ecological reference area and is one of the largest barrens complexes on public land in the state without a formal conservation designation. Thus, it could be considered for state natural area designation.

### ***Management Considerations***

High-quality pine barrens are a globally imperiled natural community and should receive special consideration for both protection and management as well as from a forest certification standpoint. Pine

barrens are also a Wildlife Action Plan priority for the Central Sand Plains Ecological Landscape. In addition, the site ranks as average to above average for climate resiliency and above average for local connectedness from an ecoregional perspective due to its good landscape context and subtle but important topographic heterogeneity, which provides a variety of local microclimate niches that allow species to shift within a site (Anderson et al. 2018, The Nature Conservancy 2019). While pine barrens are anticipated to be moderately vulnerable to climate change (WCCI 2017), they may fare best in large, less fragmented landscapes, such as the Black River State Forest, that allow species to move locally within and between sites as environmental conditions change. Fire can also play an important role in climate resiliency by stimulating drought tolerance in pine barrens species (Cavender-Bares and Reich 2012). Positive impacts of fire will be maximized when applied at larger scales.

Management to date has been local in scale, including small scale timber harvests, local herbicide treatments to reduce brush, and local scarification to promote jack pine regeneration. Management to maintain a heterogeneous mixture of canopy structure is recommended, including maintaining areas with low canopy cover and a diverse groundlayer (O'Connor et al. 2019). Shifting management from smaller to larger scales would be beneficial, such as developing a "rolling barrens" plan that maintains one or more large, central cores that are maintained in a relatively open condition bordered by large blocks that are managed for timber in successive stages, such that in any given decade, the open core is bordered by a relatively young and open management block, several blocks of intermediate age, and a more mature block. As management progresses over time, the location of surrounding open stands shifts while the total acreage of open and more closed canopy habitat is maintained, providing larger blocks of open habitat for at-risk species while minimizing small-scale intensive management efforts.

This type of management is consistent with the current Black River State Forest master plan designation of a Jack Pine Habitat Management Area (WDNR 2010a). Area specific resource management prescriptions from the master plan include:

- Actively manage jack pine stands primarily through clearcutting, using a shifting mosaic methodology which distributes harvests through the area to provide a wide age class distribution. Use a variety of regeneration techniques such as natural, direct seeding, planting, seed trees, and prescribed fire.
- Identify and designate high quality barrens vegetation sites to be maintained as permanent openings. Periodically use prescribed fire, mechanical brushing, and selective use of herbicides.
- Identify high quality barrens vegetation sites to be maintained in conjunction with timber production. These sites may be incorporated into the Karner Blue Butterfly Management Plan.

Critical components of management include regular prescribed fire to maintain the open core, survey and treatment of invasive species, and avoiding the use of deep trench-planting and limiting broadcast herbicide use in order to minimize impacts on native barrens plants and rare lepidopterans. Roadsides and firebreaks are also important corridors for barrens plants and animals, and maintenance should avoid the planting of invasive species like bird's-foot trefoil and crown vetch, as well as minimize frequent or close-crop mowing. Some roadsides appear to have been planted with invasives, which should be treated before they spread into more natural habitat.



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## CSPeL12. BLACK RIVER STATE FOREST SANDPILLOW BARRENS

### ***Location***

Property:	Black River State Forest
Landtype Association:	Black-Robinson-Harrison Terraces and Floodplains (222Ra20)
Approximate Size:	142 acres

### ***Description of Site***

Sandpellow barrens features a relatively small but exceptionally diverse pine barrens on level outwash sands. The site lies just northeast of Black River Falls near Ho Chunk Nation lands and is bounded by Sandpellow Road to the south and Mission Road to the west. The site includes both closed-canopy areas dominated by jack pine, white pine, black oak, and tall shrubs as well as more open-canopied pine barrens. Plant diversity and the number of barrens indicator species in the open areas is higher than in any other area of the Black River State Forest. Species include New Jersey tea, purple prairie clover, white prairie clover, wild lupine, showy goldenrod, white goldenrod, stiff goldenrod, rough blazing star, cylindrical blazing star, western sunflower, hairy puccoon, prairie coreopsis, leadplant, flax-leaved aster, and prairie phlox. Two small red pine plantations are also embedded in the site.

### ***Significance of Site***

This site features the highest barrens plant diversity on the Black River State Forest and likely one of the most diverse sites in the Central Sand Plains EL. An exceptional number of indicator plant species are present, putting the site in the highest possible tier for this barrens ecological integrity metric (O'Connor et al. 2019). The site lies within the Black River COA, of global significance for pine-oak barrens which support numerous rare species. The Black River State Forest is also a Land Legacy Place (WDNR 2006). Rare species present within the site include four butterflies and two plants. Overall, this site has characteristics of an ecological reference area and could be considered for state natural area designation.

### ***Management Considerations***

High-quality pine barrens are a globally imperiled natural community and should receive special consideration for both protection and management as well as from a forest certification standpoint. Pine barrens are also a Wildlife Action Plan priority for the Central Sand Plains EL. Management to date has included forestry mowing, local brush control using herbicides, and a prescribed burn.

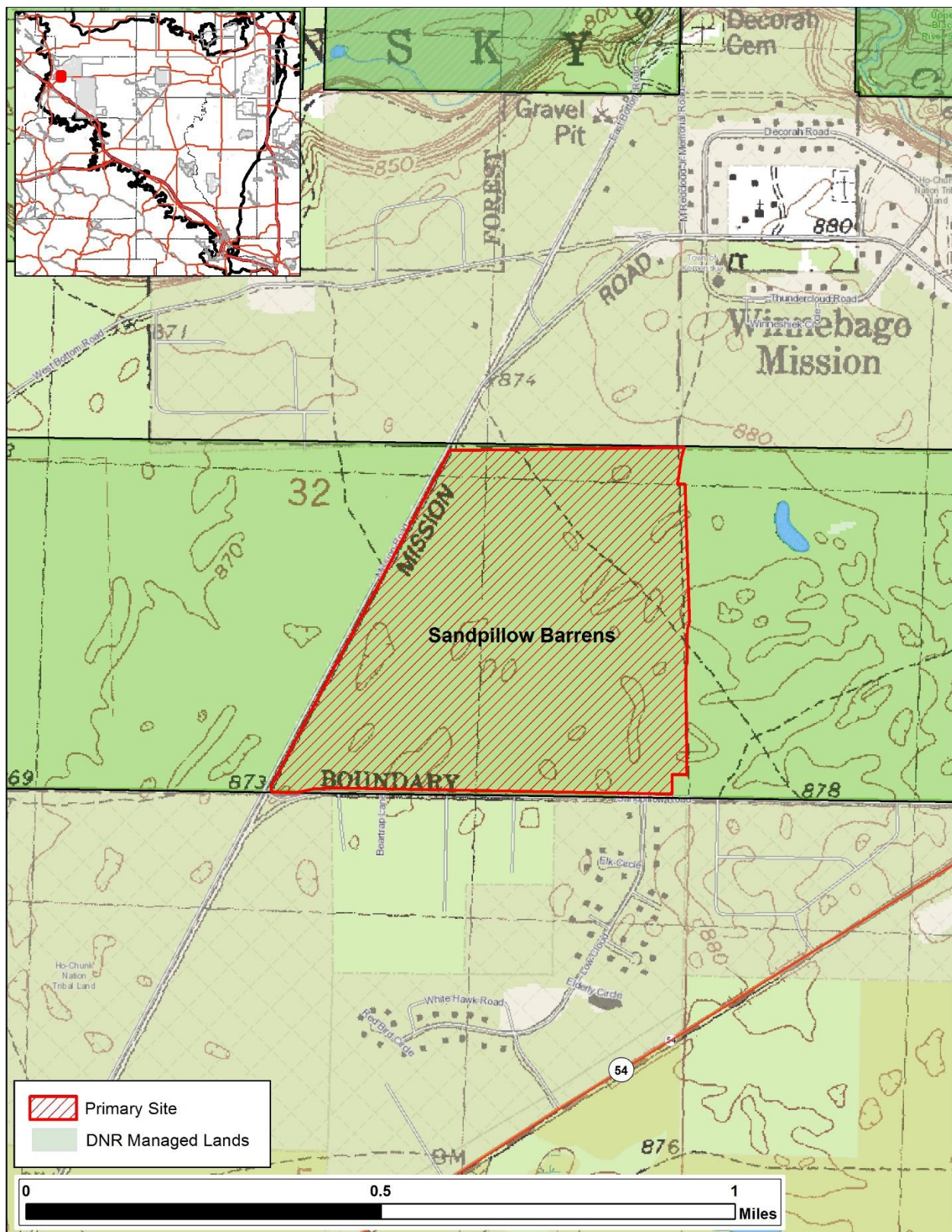
Managing to promote a more open pine barrens canopy, less brush, and diverse groundlayer is recommended (O'Connor et al. 2019). Particular management challenges include dense black oak resprouts and American hazelnut thickets, locally common prickly-ash and occasional glossy buckthorn. This site lies within the Jack Pine Habitat Management Area under the current Black River State Forest master plan (WDNR 2010a). Management prescriptions from the master plan appropriate for this site include:

- Actively manage jack pine stand primarily through clearcutting, using a shifting mosaic methodology which distributes harvests through the area to provide a wide age class distribution. Use a variety of regeneration techniques such as natural, direct seeding, planting, seed trees, and prescribed fire.
- Identify and designate high quality barrens vegetation sites to be maintained as permanent openings. Periodically use prescribed fire, mechanical brushing, and selective use of herbicides.

- Identify high quality barrens vegetation sites to be maintained in conjunction with timber production. These sites may be incorporated into the Karner Blue Butterfly Management Plan.
- Use timber harvesting, brushing, and selective herbicides along roadsides and between stands to develop vegetative corridors and to maintain or increase width of open areas.
- Actively manage red pine stand primarily through thinning. Prior to and/or at rotation, use herbicide and/or prescribed fire to reduce oak component where necessary for site preparation and to stimulate and improve barrens vegetation near stand edges and within smaller stands.

Critical components of management include regular prescribed fire to maintain the open core, survey and treatment of invasive species, and avoiding the use of deep trench-planting and limiting broadcast herbicide use in order to minimize impacts on native barrens plants and rare lepidopterans. Roadsides and firebreaks are also important corridors for barrens plants and animals, and maintenance should avoid the planting of invasive species like bird's-foot trefoil and crown vetch, as well as minimize frequent or close-crop mowing. Some roadsides appear to have been planted with invasives, which should be treated before they spread into more natural habitat.

The location of this site, lying between two developed areas on Ho Chunk Nation lands, limits large-scale habitat management opportunities. Given the close proximity of the site to tribal lands, the importance of fire as a cultural habitat management tool, and cultural benefits of restoration (increased blueberry foraging opportunities, etc.), there may be opportunities to engage the Ho Chunk community and learn from Traditional Ecological Knowledge, build a community of local support, and cooperatively manage and steward the site over time.



**CSPEL12. Black River State Forest Sandpillow Barrens Primary Site**

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## **CSPeL13. BLACK RIVER STATE FOREST MILLSTON RIDGE BARRENS**

### ***Location***

Property: Black River State Forest  
Landtype Association: Trempealeau Sandstone Hills (222Lb07)  
Approximate Size: 193 acres

### ***Description of Site***

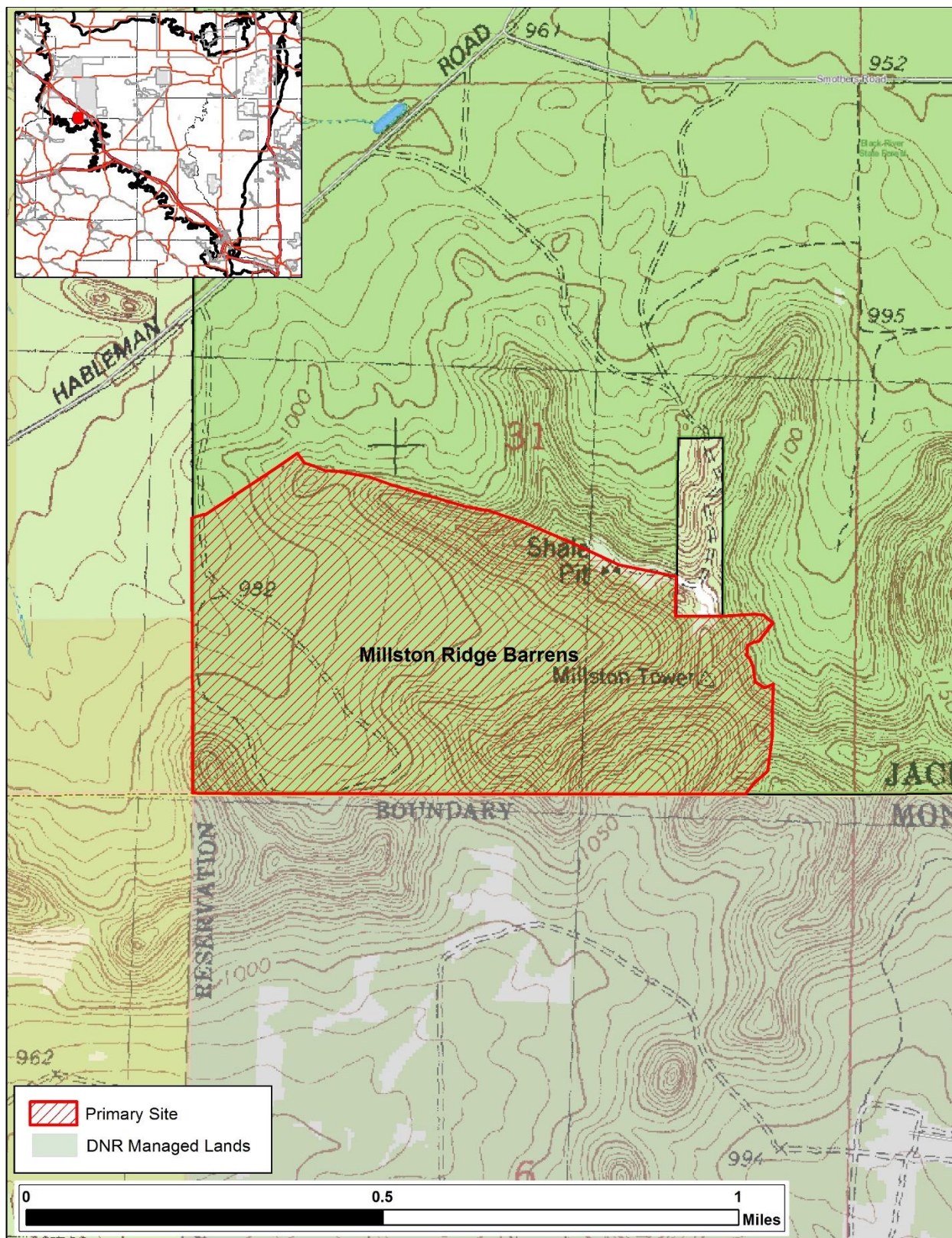
Millston Ridge Barrens features an open oak barrens grading into partially closed canopy barrens on a narrow sandstone ridge trending east-west and rising 200 feet above the surrounding sand plain. On the southeast portion of the site, a flat ridgetop and associated steep slopes support a southern dry forest of stunted but mature white oak on shallow soils. The southwest portion of the site currently includes a red pine plantation. Oak barrens across the site are variable in composition and structure depending on the degree of canopy closure. Most of the site is dominated by short-statured black oak (approximately 40 feet tall) and a locally dense understory of white pine along with black cherry. Cherry and huckleberry dominate the shrub layer. Ground layer plants are diverse with abundance highest in more open areas. Oak barrens indicator plants include June grass, round-headed bush-clover, silky aster, prairie coreopsis, rough blazing star, western sunflower, bird's-foot violet, hoary puccoon, hairy puccoon, Wisconsin beard-tongue, and wild lupine. In more closed-canopy areas, plants include vegetative wild lupine, whorled loosestrife, woodland sunflower, pale vetchling, and annual false foxglove.

### ***Significance of Site***

This site features a small but high-quality oak barrens adjacent to Ft. McCoy, one of the best landscape-scale barrens in the state. A high number of barrens indicator plant species are present, putting the site in the highest possible tier for this barrens ecological integrity metric (O'Connor et al. 2019). The site lies within the Fort McCoy Barrens and Oak Savanna COA, of global significance for pine-oak barrens and savanna which support numerous rare species. The site also lies within the Black River State Forest, a Land Legacy Place (WDNR 2006). Rare species present within the site include a federally endangered butterfly, three reptiles, and three plants. For two of the rare reptiles, this is the only place they are known to occur on the Black River State Forest. Overall, this site has characteristics of an ecological reference area and could be considered for state natural area designation.

### ***Management Considerations***

High-quality oak barrens are a globally imperiled natural community (global rank of G2) and should receive special consideration for both protection and management as well as from a forest certification standpoint. Oak barrens are also a Wildlife Action Plan priority for the Central Sand Plains EL. Management to date has included wildlife opening maintenance, selective understory thinning targeting white pine, and limited invasive species control. Additional management is warranted to increase the acreage of open barrens, reduce brush and oak resprouts, and reduce white pine in the understory. In addition, selective thinning of oak and prescribed fire would be useful for stimulating barrens plants like wild lupine, which is largely vegetative and suppressed across much of the site. Glossy buckthorn is locally established but sparse within much of the site and should be a management priority. Areas with more dense infestation, such as pine plantations, should be targeted for secondary control (e.g., containment/slowing the spread). Red pine plantations within and adjacent to the site could be considered for gradual conversion to other types such as jack pine or oak.



**CSPEL13. Black River State Forest Millston Ridge Barrens Primary Site**

# Future Needs

This project was designed to provide a biotic inventory of the biodiversity values for the Central Sand Plains Ecological Landscape. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species of the CSP EL.

## Invasive Species

- Comprehensive invasive species inventory and management plans are needed for each property. This is especially important for large properties with globally significant opportunities, such as Black River State Forest and Quincy Bluff. Plans should include a monitoring strategy for detecting and rapidly responding to new invasive threats. Early detection and rapid response is much more cost-effective compared to waiting until invasives are well-established on the landscape. Examples of species that were detected on properties but that do not appear to be widespread in the CSP EL include oriental bittersweet, Japanese barberry, Maack's honeysuckle (*Lonicera maackii*). Glossy buckthorn and common buckthorn are also present on many properties but occur at low densities or local populations and control is still feasible in high-quality areas. This list is not intended to be a comprehensive and species noted above are included only as examples. Please consult the DNR invasive species program for the most up to date list of known species distributions and strategic priorities.

## Natural Communities

- Conduct periodic monitoring of oak and pine barrens, especially in conjunction with management to restore structure and groundlayer, and control invasive species.
- Resurvey areas on the Black River State Forest and adjacent Meadow Valley and Sandhill Wildlife Areas, which were last inventoried comprehensively in the late 1990s.
- Survey other large blocks of public lands in cooperation with federal and county partners, such as Necedah Fish and Wildlife Refuge, Fort McCoy, and Jackson, Clark, Adams, and Wood County Forests.
- Monitor sites where sanitation cuts have been implemented to limit impact and spread of oak wilt; this may help inform future management strategies for this difficult-to-control pathogen.
- Consider monitoring groundwater levels and impacts of lowered levels on property streams and wetlands.

## Rare Plants

- Continue to survey for rare plants not observed in the past 20 years.
- Monitor populations of rare Central Sand Plains EL specialists such as cliff cudweed, Lapland azalea, woolly milkweed, dwarf milkweed, and sand violet.

## Birds

- Continue monitoring grassland bird species, especially in the Central Wisconsin Bird Conservation Area, such as greater prairie-chicken, Henslow's sparrow, grasshopper sparrow, vesper sparrow, bobolink, dickcissel, eastern meadowlark, western meadowlark, upland sandpiper, and short-eared owl.
- Continue monitoring oak savanna and barrens specialists, such as Kirtland's warbler, red-headed woodpecker and whip-poor-will. Identify and map suitable pine barrens or pine plantations to target for protection for Kirtland's warbler.

## **Small Mammals**

- Continue small mammal surveys at suitable grassland and barrens sites in the Central Sand Plains Ecological Landscape to inventory for common and rare prairie and grassland species (e.g., prairie vole, prairie deer mouse, Franklin's ground-squirrel).

## **Herptiles**

- Conduct inventory of eastern massasauga, gophersnake, North American racer, prairie skink, and slender glass lizard in barrens habitats.
- Continue to conduct visual searches for four-toed salamander, pickerel frog, Blanding's turtle, and wood turtle in the vicinity of aquatic habitats.
- Continue long-term abundance monitoring surveys for wood turtles within the Black River State Forest on 5-10 year intervals.

## **Invertebrates**

- Conduct inventory and monitoring of barrens-associated butterflies, moths, and other insects, especially Karner blue, frosted elfin, Ottoe skipper, Persius duskywing, and phlox moth.
- Conduct periodic inventory and monitoring of rare dragonflies such as the Wisconsin endemic Sioux (sand) snaketail as well as ringed boghaunter and incurvate emerald.

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